EXCAVATING ENGINEER

1940 Highway Forecast

January 1940

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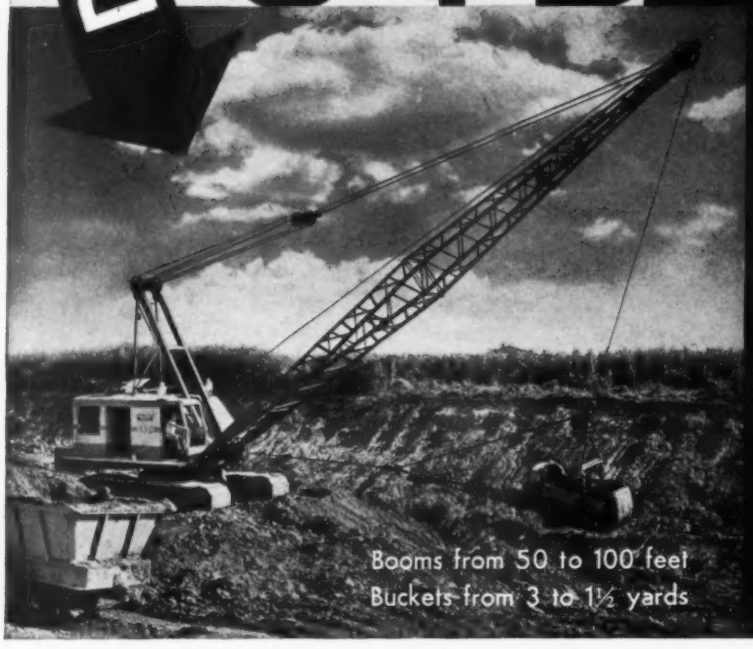

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EXCAVATING ENGINEER

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A construction view of California's Arroyo Seco speedway, which will be a 10-mile express route between Pasadena and Los Angeles' business section. Financed out of state gas tax funds this $3,745,000 boulevard with its raised roadbed, stream overpasses, intersection underpasses, and four lane width marks the trend of tomorrow's roads. (Spence Air Photo)

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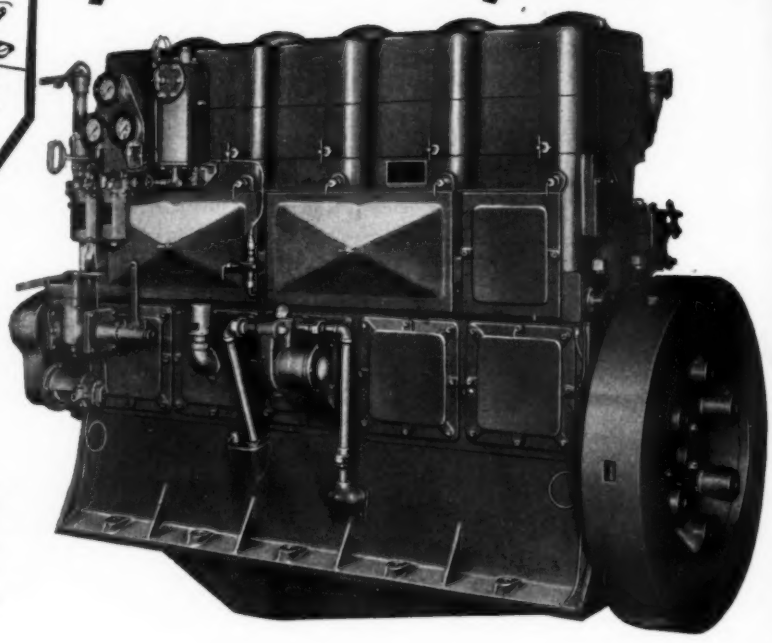
THERE ARE NO 'Bugs' IN These Engines



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Excavating Engineers
1940 Highway Forecas

Roadbuilders, Inc.

THE STATE-BY-STATE highway forecast on the following pages is a story of the many advantages of Federal-State co-operation in the construction of those ribbons of smooth-surfaced concrete and dirt that hold this great nation together.

Co-operation of governmental agencies has made this country the world's largest builder of roads, and these roads in turn have been an essential factor in co-ordinating the nation's ever growing industrial and agricultural activities.

America's future is closely woven with the efficiency of its highway system. Alone, neither State nor Federal government could provide adequate roadways between our far-flung boundaries. Together, they form a road building combination that will assure this nation's continued leadership in highway construction.

As the following pages give an extensive account of future State highway plans, a brief discussion of the Federal 1940 program will complete our picture.

Reports from the Public Roads Administration indicate the following funds will be set aside for government use in their fiscal year beginning July 1, 1940: for the Federal Aid system and its extensions into and through cities, $115,000,000; for secondary or feeder roads, $15,000,000; for elimination of hazards at railroad grade crossings, $30,000,000.

In addition to these funds to be apportioned to all states, there has been authorized for use in the next fiscal year $13,000,000 for forest roads; $2,000,000 for public land roads; $5,000,000 for National parks; $8,000,000 for National parkways; and $3,000,000 for Indian roads.

During recent years the Work Projects Administration has also been a contributor to the improvement of the nation's highway system. Approximately 110,000 miles of new and improved streets and highways were added to the country's network of roads through projects completed during the fiscal year by this agency.

At the close of the fiscal year ended June 30, 1938, the WPA had constructed or improved nearly 280,000 miles of highways, roads and streets. However, since work started previous to June 30, 1938 but completed in the fiscal year 1939 is included in both sets of figures, they cannot be added to compute the exact accomplishment total for the WPA program to date.

During the fiscal year 1939, WPA workers completed projects for 97,844 miles of rural roads, 11,550 miles of urban streets and alleys, and 1,389 miles of other roads (parks, cemeteries, etc.). The great bulk of the WPA highway program in 1939, as in the preceding years, consisted of construction or improvement of rural roads. Relief workers employed on this type of project completed work on 93,216 miles of unpaved secondary roads, constructed 2,258 miles of new paved roads and improved 2,370 miles of paved roads in country sections. During the same period the WPA paved 2,463 miles of new streets and alleys, improved 2,331 miles of paved city streets, and built 6,756 miles of unpaved city streets.

At the beginning of the calendar year of 1939 the street and highway program represented about 45 per cent of all WPA employment. As an emergency program offering benefits to the communities, WPA highway work stands out, as many thousands of farmers who profit by farm-to-market roads will testify.

Another government agency which has contributed much to the betterment of the nation's highway system is the Public Works Administration. Since this agency is winding up its program due to the fact that the last Congress did not provide for its continuance, there are no street and highway construction plans for 1940 other than completing those projects that are still under construction.

A brief review of PWA's accomplishments reveals that from 1933 to date there have been 605 road and highway projects with estimated construction costs of $286,282,043 for which PWA made grants of $115,849,318 and loans (to be repaid) of $11,786,000. There were 779 street projects with construction costs of $125,719,726, with PWA grants of $48,631,823 and loans of $3,633,114. Closely allied to street and highway classification have been 29 grade crossing eliminations with estimated construction costs of $27,668,506, with PWA grants of $10,573,714 and loans of $870,000. There have also been 379 bridge and viaduct projects with estimated construction costs of $222,376,555, with PWA grants of $73,824,613 and loans of $53,227,662.

Under the 1938 program and included in the above figures were 232 road and highway projects with costs of $149,602,184, PWA grants of $66,471,002 and loans of $155,000. There were 311 street projects costing $60,281,238, PWA grants of $25,991,867, and loans of $357,000. Allotments were made for 13 grade crossing eliminations with estimated construction costs of $13,502,420 and PWA grants of $5,908,944 and loans of $807,000.

Several of the states had statewide highway programs financed in part by PWA and among those still under construction with percentages of completion are: West Virginia, 92%; Mississippi, 71%; and Missouri, 80%. There are also many county programs, particularly in the midwestern states that are still under construction, and it is estimated that the 1938 street, road and highway projects were as of December 1, 1939, 70% complete. PWA officials estimate that there is approximately seventy million dollars' worth of highway and road construction allotted under the 1938 program yet to be completed with a few exceptions between now and June 30, 1940.

And so we have a brief picture of the forces behind our future highway plans. Combined, these Federal agencies and State highway departments are the world's greatest and most efficient builders of roads.

State-by-State FORECAST

Alabama

Expenditures for Alabama's fiscal year ending October 1, 1939 totaled $20,170,329. This sum was used in the following amounts: construction $11,303,910; maintenance $2,076,286; and bond retirement, interest and all other charges $6,790,133.

These funds covered the following construction program:

	Miles
Grading and drainage	693
Surfacing—	
Temporary	100
Base course	588
Bituminous prime coat	617
Bituminous mat coat	688
Other	3
Bridges	5

Alabama highway officials estimate a slight decrease in work mileage for 1940 because of their aim for a higher standard of highway construction.

It is estimated that the state will have $18,800,000 available for highways in the current fiscal year ending October 1, 1940. This amount will be allocated in the following manner: construction $11,300,000; maintenance $2,000,000; and bond retirement provisions, interest and other charges $5,500,000.

Funds for these amounts will be covered by the following estimated sources: money on hand, $1,309,000; motor vehicle license taxes $2,960,000; gasoline excise taxes $7,000,000; motor bus carrier fees $140,000; Federal contributions $5,490,000; and county aid $2,011,000.

Arizona

With $6,915,000 available for 1940 activities, Arizona's highway department will increase this year's expenditures about 14% over 1939. The 1940 funds have been apportioned in the following manner: construction, $5,500,000; maintenance, $1,165,000; and other costs (including construction and maintenance equipment), $250,000.

This money is available from these sources: regular Federal Aid, 39.3%; other Federal, 21.2%; state gas tax, 27.2%; and vehicle license fees and other income, 12.3%.

Arizona's 1940 construction money is being allocated to grading, $407,000; oil treatment surfacing, $396,000; paving, high type, $550,000; paving, low type, $3,817,000 and erection of 11 bridges at a cost of $330,000.

There were no highway funds diverted in Arizona during 1939.

Arkansas

Tentative arrangements being perfected at this time for Arkansas' 1940 highway program contemplate the use of Federal funds through the form of toll bridge income made possible through the state freeing all state-owned and operated toll-bridges in the spring of 1938. The funds involved are the following amounts:

Regular Federal Aid	$1,970,000
Secondary Federal Aid	254,000
Total	$2,224,000

In addition to these funds Arkansas expects carry over balances in the amount of about $500,000, making a total of about $2,750,000 available for the state's 1940 road building activities which are planned under the following general classifications:

Pavement (high type)	15 miles
Bituminous Surfacing (road mix or equivalent)	115 miles
Untreated gravel surfacing	10 miles
Major bridges	3,000 lin. ft.

Grade crossing separation as protection funds allocated to Arkansas from Federal sources, and not requiring matching, are about $520,000 for the state's 1941 fiscal year, beginning July 1, 1940. In addition, a $225,000 carry-over from previously allotted Federal funds will make the available sum for contract about $750,000. This amount is expected to finance the construction of eight separation structures, one relocation project, and several signal installations.

California

California's Division of Highways operates on a biennial basis and the current two-year period extends from July 1, 1939 to June 13, 1941.

Estimated revenue from state highway activities from Federal and state sources during the present two-year period are shown in the following tabulation:

Regular Federal Aid funds	$ 8,000,000
Federal Aid feeder funds (1 yr. only)	560,000
Federal grade crossing funds	1,800,000
State's and cities' shared gas tax	64,000,000
Diesel oil tax	600,000
State's share, motor vehicle fees	7,600,000
Total	$82,560,000

Construction items included in the state highway budget for the current biennium amounted to $35,161,000, which with the $1,800,000 in grade crossing funds made a total construction program of $36,961,000 for the two years. Maintenance operations for this same period are estimated at $18,200,000. No highway funds were diverted to other than road purposes in California.

State highway officials estimate that the remaining eighteen months of the biennium will see the spending of approximately

● Left: A side hill cut through heavy rock was made to provide for this finished Arkansas highway shown at the right.

$27,083,000 for bridge and highway construction purposes. This work will include construction financed from funds as follows:

Regular Federal Aid (feeder funds and state funds for current biennium)	$24,366,000
Federal grade crossing funds for current biennium	1,772,400
Funds remaining from last biennium	944,600
Total	$27,083,000

It is estimated that during the calendar year of 1940 approximately two-thirds of this work will be let to contract and actual work started. This means that during 1940, construction in the sum of approximately $18,055,000 will be undertaken by California. Maintenance work for 1940 will amount to about $6,082,400.

Colorado

Assignment of $9,825,000 for Colorado's 1940 highway program means a decrease of 20% under 1939 expenditures according to W. M. Williams, Director of Publicity. Major portion of this sum will be $7,600,000 set aside for construction purposes. Allotment of $1,500,000 for maintenance and $725,000 for other expenses make up the balance of the amount.

Colorado's 1940 income is to be derived from the following:

Federal Funds—	
Regular Federal Aid	$2,630,000
Other	1,355,000
State Funds—	
State gas tax	4,840,000
Vehicle license fees and other	1,000,000
Total	$9,825,000

Construction fund allocations call for 175 miles of grading and gravel surfacing at $6,600,000 and 600 miles of oil treatment costing $1,000,000. In addition to this work, $1,300,000 worth of excavation previously bid will be carried over into 1940.

Diversion of road funds is prohibited in Colorado by state constitutional amendment.

Connecticut

The $19,304,285 available for 1940 highway use in Connecticut represents an increase of 7½% over 1939 expenditures.

The State Highway Department has allocated these funds to include construction work amounting to $9,863,320; maintenance totalling $3,660,715; and other work requiring $5,780,250. Plans for the division of construction funds are in a preliminary stage.

Sources of income are: Regular Federal Aid, $2,800,000; other Federal sources, $688,080; state gas tax, $9,765,000; and vehicle license fees, $6,785,005.

There was no diversion of highway funds in Connecticut in 1939.

● Cutting this road through the heavy rock of California's Yosemite National Park called for the services of a Gardner-Denver compressor and sinking drills.

Delaware

A total highway expenditure of $3,550,000 is planned in Delaware in 1940 according to figures released by Samuel Knopf, Principal Assistant Engineer. This represents an increase of 7% over the 1939 program.

Construction will amount to $1,250,000; maintenance $900,000; and other costs $1,400,000.

Payment for these expeditures will be made out of income derived from the following funds: Regular Federal Aid (primary and secondary) $731,000; other Federal funds (railroad crossing); state gas tax $2,100,000; and vehicle license fees and other income $975,000.

Delaware's 1940 construction funds have been allocated in the following manner:

	Miles	Amount	Quantities Required
Grading	10	$150,000	400,000 (Yds.)
Surfacing—			(Tons)
Gravel or crushed stone	50	100,000	30,000 (Gals.)
Oil treatment	200	80,000	1,000,000
Paving, high type	8	320,000	
Paving, low type	50	300,000	
Bridges (6)		300,000	

All 1939 highway excavation awards were completed, leaving no additional work to be carried over into 1940.

District of Columbia

A 7% decrease in available highway funds for 1940 is reported for the District of Columbia by L. P. Robertson, Engineer of Streets. The program will include $2,555,000 for construction; $900,000 for maintenance and $401,920 for other costs, such as administration, engineering and land.

Funds will be made available by regular Federal Aid, $635,000; Federal grade crossing allotment, $146,000; gas tax $3,085,000; and vehicle license fees $1,830,125.

Construction to be undertaken covers 200,000 yards of grading to cost $50,000; high type paving to cost $2,210,000; and 3 bridges to total $1,076,000. Gravel surfacing, oil treatment and low type paving will be handled through the maintenance allotment. In addition to the above work, approximately $137,000 will be spent for trees and land; $340,000 for the vehicle and traffic division; and $530,000 for traffic enforcement.

No work will be carried over from 1939 and there was no diversion of highway funds.

Florida

Inquiry regarding Florida's 1940 highway program brought the following wire:

UNABLE GIVE INFORMATION PLANS 1940. APPROXIMATE EXPENDITURES 1939 $13,000,000 CONSTRUCTION; $3,000,000 MAINTENANCE.

J. A. RIVIERE
STATE ROAD DEPARTMENT

Georgia

W. B. Brantley, State Highway Engineer, reports Georgia's 1940 expenditures about the same as '39. Available for the coming year's program will be $22,606,700 allocated in the following manner: construction $17,306,700; maintenance $2,500,000; and other costs $2,800,000.

Funds in payment of the program will be derived in the following manner: regular Federal Aid $5,551,900; other Federal $4,406,800; state gas tax $10,000,000; and vehicle license fees and other income $2,500,000.

Major allotments of the 1940 construction fund include: 610 miles of grading operations at $6,100,000; 640 miles of surfacing at $7,706,000; and construction of 170 bridges for $3,500,000.

No data are available at present covering carry-over awards previously made. Although the highway department lent $2,000,000 to other state departments this sum has been pledged for repayment by the end of the state's fiscal year.

Idaho

An increase of $300,000 over 1939 highway expeditures marks the $6,389,710 set aside by Idaho for her 1940 program.

This sum will cover the following disbursements: construction $3,007,243; maintenance $1,750,000; motor fuels tax (diverted to local units) $1,000,000; WPA sponsorship $200,000; administration $168,000; preliminary surveys $185,000, and miscellaneous $79,467.

Payment for the above expenditures will be made with funds derived from the following sources:

Federal Funds—	
Federal Aid	$1,599,580
Federal lands	97,280
Grade separation	242,550
State Funds (estimated)—	
Motor fuels tax	4,338,000
Other motor vehicle imposts	112,000
Total	$6,389,710

Figures on the division of Idaho's 1940 construction funds were not available at this publication date.

Illinois

Illinois' Division of Highways reports that their 1940 construction program is not definitely determined.

It is believed that Illinois will carry over into the next construction season the following work under contract up to the first of the year: 73 miles pavement, 13 miles bituminous surfacing, 85 miles gravel or stone, 73 miles grading, 20 highway and railroad grade separations, and 39 bridges. The estimated value of this carry-over is about $15,000,000.

Funds available for the award of 1940 construction contracts will be approximately $13,000,000. This amount will include about $6,800,000 in Federal funds.

A detailed list of the various classes of work planned for 1940 was not available at press time.

Indiana

A 10% increase in highway funds gives the State Highway Commission of Indiana a budget of $27,115,000 for 1940. Of this total $19,533,000 will be used for construction; $4,500,000 for maintenance; and $3,082,000 for other work.

The breakdown of construction funds into types of work has not been completed, but preliminary plans call for 229 miles of grading, $1,825,000; 174 miles of high type paving, $5,253,000; 116 miles of low type paving, $1,296,000; and 38 bridges costing $773,000.

Federal funds, including Federal Aid funds remaining from 1939, will account for $7,216,500 of the total budget; the state motor vehicle account will furnish the balance of $19,898,500. About $2,000,000 in previously awarded excavation will be carried over into 1940.

Iowa

Almost $3,600,000 is being spent in the reconstruction of sec-

● Working on a road paving job near Barrington, Illinois, the Arrow Petroleum Company of Chicago produced 125 tons of bituminous mix per hour with this combination Barber-Greene drying, mixing, and finishing plant.

(1) A scenic view of Ohio's new Hocking river bridge on U. S. 33 constructed at a cost of $297,453. (2) A pavement breaking job in Ottumwa, Iowa, is handled with a Hardacog Wender compressor and pavement breaker by Sani Construction Co., of Des Moines. (3) Kentucky's outstanding 1939 highway project was the completion of a 12-mile section of four lane divided highway on U. S. 60. (4) Mississippi solved a traffic congestion problem by the construction of this bypass of Jackson on U. S. 80. (Stevens Air Photo) (5) This old tubular bridge crossing the Colorado river on U. S. 81 was replaced by Texas with (6) a modern steel girder structure.

● Warren County, Iowa, uses a Caterpillar Diesel and a six-yard Austin Western scraper on a secondary road building job near Indianola.

ondary roads in Iowa during the current fiscal year. Under a Public Roads Administration feeder road construction program, the state is furnishing $1,800,000 and the federal bureau a like sum for construction and improvements on Iowa's secondary road system between July 1, 1939, and July 1, 1940.

Iowa had completed 22.9 miles of Federal-Aid secondary road improvements between the opening of the fiscal year and September 30. On October 31, the date of the latest statistical report, construction was under way on 52.5 miles of secondary roads. The Public Roads Administration has approved construction of an additional 148.3 miles of secondary roads and has on hand a balance of $1,004,703 which it expects to be spent for Iowa feeder road work on or before next June 30.

Also completed during the current fiscal year were 108.8 miles of Federal Aid highways at an estimated cost of $2,353,005. Of this amount, $1,097,074 was provided from Federal funds. At present 107.4 miles are under construction at an estimated cost of $4,769,192. Iowa has $874,954 available for programmed Federal projects.

Kansas

A total highway expenditure of $19,100,000 is planned in Kansas for 1940 according to figures released by state highway officials. This sum is about the same amount used for 1939 work.

Construction will amount to $8,600,000; maintenance $4,500,000; and other expenses set by state statutes $19,100,000.

Sources of these funds will be as follows: $2,800,000 regular Federal Aid; $1,900,000 other Federal allotments (including $700,000 for F. A. secondary road projects); $9,700,000 state gas taxes; and $4,700,000 derived from state vehicle license fees and other income.

Final construction allotments are not yet available, but it is estimated that 20 to 30 miles of paving work will be let, considerable stabilized base and armor coat work is planned, and 60 to 70 bridges are to be constructed, the majority being of the multiple-box type.

In addition to the above work, 4,000,000 yards of excavation let previously for about $800,000 will be carried over into 1940.

No highway funds were diverted in Kansas in 1939.

Kentucky

According to R. Y. Fishback, Engineer of Road Design, the $18,840,000 available for Kentucky's 1940 road program represents an 8% increase over 1939 expenditures. These funds are to be allocated in the following manner: construction $8,000,000; maintenance $6,000,000; rural road repair $2,000,000; and other costs $2,840,000.

Funds for the above program are to be received from the following sources: regular Federal Aid $2,570,000; other Federal $770,000; state gas tax $12,700,000; and $2,800,000 from state vehicle license fees and other income.

Allocation of Kentucky's 1940 construction funds will be made in the following manner:

	Miles	Amount
Grading	50	$1,000,000
Surfacing—		
Gravel or crushed stone	100	1,000,000
Oil treatment	250	2,000,000
Paving, high type	65	2,000,000
Paving, low type	70	1,200,000
Bridges (45)		800,000

In addition to the above activities 1,000,000 yards of excavation previously awarded for $300,000

(Continued on page 36)

● Construction of Kentucky's U. S. 31 near Fort Knox was handled by John F. Bloomer of Wisconsin with the aid of a fleet of Caterpillar Diesel tractors and LeTourneau equipment.

FEDERAL AID HIGHWAY PROJECTS
AS OF OCTOBER 31, 1939

STATE	COMPLETED DURING CURRENT FISCAL YEAR			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR PROGRAMMED PROJECTS
	Estimated Total Cost	Federal Aid	Miles	Estimated Total Cost	Federal Aid	Miles	Estimated Total Cost	Federal Aid	Miles	
Alabama	$ 1,740,986	$ 864,785	100.6	$ 7,917,594	$ 3,892,318	259.9	$ 520,090	$ 259,040	10.2	$ 2,724,845
Arizona	972,915	676,732	38.5	1,850,334	1,273,112	93.9	364,101	241,364	20.9	746,615
Arkansas	4,346,672	3,364,023	185.1	831,620	804,785	37.6	1,360,957	719,635	61.1	339,956
California	4,335,690	2,369,920	59.8	3,081,581	1,656,863	56.7	1,568,019	822,299	34.6	2,807,576
Colorado	1,665,527	918,250	41.4	3,311,197	1,844,183	77.8	366,428	206,519	7.8	1,636,253
Connecticut	357,558	176,334	5.1	1,964,755	977,627	19.9				1,237,956
Delaware	516,499	252,872	12.0	1,278,959	626,818	26.4	181,020	90,510	.1	1,019,316
Florida	121,000	59,928	1.4	4,284,214	2,141,882	72.9	505,649	252,825	7.9	2,500,855
Georgia	2,713,300	1,356,650	150.8	6,296,468	3,148,234	346.7	1,459,842	729,921	43.2	5,071,027
Idaho	1,658,103	999,180	82.6	1,155,908	703,715	64.6	274,979	154,602	27.0	1,055,403
Illinois	4,083,413	2,032,669	106.9	8,650,009	4,323,762	167.9	1,272,438	634,825	24.4	2,627,322
Indiana	2,115,702	1,057,851	38.6	6,069,452	3,010,126	135.3	732,436	366,143	13.7	1,865,082
Iowa	2,353,005	1,097,074	108.8	4,769,192	2,099,858	170.4	193,010	91,190	8.0	874,954
Kansas	2,375,055	1,179,822	130.8	2,398,403	1,198,322	115.4	2,915,692	1,457,846	148.1	4,043,296
Kentucky	1,428,269	714,135	48.7	3,668,742	1,832,815	94.4	915,801	457,900	23.1	2,696,361
Louisiana	318,148	156,000	10.8	12,132,849	3,115,133	49.7	1,518,979	742,323	45.1	2,361,588
Maine	1,813,070	906,176	42.1	1,031,510	515,755	24.8	90,670	45,335	2.7	287,017
Maryland	1,249,690	595,711	21.0	2,564,573	1,267,905	37.4	473,000	232,500	8.3	1,816,744
Massachusetts	3,107,045	1,550,834	25.1	713,333	355,469	4.5	1,258,822	627,124	7.5	2,486,225
Michigan	2,471,624	1,206,013	65.5	4,213,089	2,104,400	131.3	682,200	246,200	8.2	2,748,504
Minnesota	3,021,247	1,503,732	198.1	5,395,173	2,675,117	285.6	1,611,402	804,611	70.1	3,081,111
Mississippi	658,400	238,370	35.3	9,163,058	3,448,335	362.5	491,900	227,650	15.4	2,101,461
Missouri	1,452,003	725,302	55.9	5,105,064	2,518,032	180.7	2,742,221	1,138,414	93.0	3,889,219
Montana	1,670,146	944,760	111.4	2,159,501	1,221,799	86.3	1,770,551	1,004,254	113.9	3,485,875
Nebraska	1,159,765	574,441	76.1	6,126,753	3,062,728	571.0	2,045,743	877,990	202.8	2,509,368
Nevada	974,123	836,466	48.7	617,017	529,657	24.7	603,296	518,547	28.5	625,668
New Hampshire	539,946	264,083	18.1	949,318	467,479	21.3	228,372	113,783	9.1	881,230
New Jersey	400,110	191,531	3.6	4,409,098	2,202,999	34.4	180,660	98,330	.1	1,835,924
New Mexico	1,290,907	795,998	108.3	980,780	598,068	38.6	496,131	309,635	38.6	1,128,560
New York	4,660,080	2,298,697	89.5	13,967,219	6,751,448	226.7	1,470,990	602,595	16.1	1,099,572
North Carolina	2,794,090	1,394,965	172.7	6,105,823	3,045,372	322.7	653,610	311,720	38.1	1,335,891
North Dakota	134,060	71,820	28.5	1,297,335	695,199	84.9	2,241,260	1,201,261	244.7	3,363,394
Ohio	2,702,668	1,351,334	32.5	9,116,948	4,489,760	98.0	3,140,160	1,450,580	27.9	5,709,230
Oklahoma	1,223,129	649,003	33.8	2,448,975	1,298,625	99.9	2,633,570	1,382,197	85.4	3,012,834
Oregon	1,687,139	1,005,727	89.1	2,432,864	1,455,960	85.2	1,276,854	600,150	36.4	1,039,348
Pennsylvania	4,601,129	2,283,475	63.0	8,677,516	4,168,217	76.6	3,025,417	1,500,078	37.3	3,147,258
Rhode Island	477,910	238,835	6.9	340,616	170,121	3.2	726,151	362,550	6.5	870,693
South Carolina	1,418,740	639,800	64.1	1,442,574	637,686	22.2	785,140	349,200	60.4	2,145,997
South Dakota	1,823,240	1,007,274	177.8	3,794,559	2,117,860	359.2	1,271,900	716,340	163.1	2,902,674
Tennessee	2,390,148	1,126,512	42.7	3,500,068	1,750,034	86.4	990,674	495,337	18.4	3,425,551
Texas	7,566,986	3,713,589	446.0	8,064,001	4,016,253	322.7	2,011,982	966,505	118.8	5,459,832
Utah	1,802,564	1,290,958	80.9	807,965	593,700	54.2	397,045	200,850	10.0	685,854
Vermont	708,655	347,793	17.8	209,404	104,512	5.5	631,844	315,900	20.9	301,224
Virginia	1,583,530	789,668	52.0	2,664,668	1,283,615	65.4	699,304	344,453	15.2	925,789
Washington	1,443,003	750,367	19.3	3,235,330	1,566,045	29.5	997,102	459,564	18.6	487,088
West Virginia	748,677	411,000	25.8	2,700,515	1,367,495	66.7	723,900	357,645	19.1	1,829,157
Wisconsin	3,845,993	1,887,062	140.3	6,096,440	2,998,880	188.6	393,586	185,145	14.6	1,637,742
Wyoming	1,204,864	752,152	118.0	689,717	422,277	75.3	713,328	450,147	66.3	563,935
District of Columbia				341,624	170,812	2.1	106,700	53,350	1.0	263,338
Hawaii	139,841	66,868	1.0	993,980	480,750	16.4	579,027	286,093	10.1	1,055,906
Puerto Rico	647,050	322,600	13.8	1,282,253	635,060	24.9	83,226	40,975	.6	376,160
TOTALS	94,513,414	50,009,141	3,646.6	193,299,938	93,836,977	5,908.9	52,377,179	26,095,950	2,102.9	102,123,778

"A L

IN THE HEART of the Southern California citrus belt a huge structure of rolled earth, concrete and rock is rapidly taking shape. Prado Dam, so named because of the community its impounded water will obliterate, is being built as a part of the dam system designed for flood control purposes in Southern California by the United States Engineers.

Rising 105 feet above the Santa Ana River, Prado Dam stretches its massive bulk 2,300 feet across the valley near the head of the Santa Ana Canyon, 35 miles inland from the blue Pacific, into whose depths will empty the waters tamed by El Prado.

All the color and tradition of El Prado, that Spanish part of old Madrid, from whose ancient lineage sprang this still sleepy California village, enters into the typically native parts of the dam. It bespeaks itself most strongly, perhaps, in that part of the structure composed of the native rock. For here are the ties that bind frontier after frontier in the unity that is a construction job. Dark, sleepy Mexicanos lounge in the shade during their lunch hour siesta. Bustling, important Americanos peer through surveying instruments. A dozen nationalities work hand in hand in this common melting pot. And out of their efforts arises the rock portion of the dam.

"J. B." Wins the Rock Contract

We fold back Time one year, to stand in a contractor's office soon after the original contract calling for the construction of Prado Dam was let. A contractor's executive is speaking.

"You can't possibly make it, 'J. B.'," he warned. "I think you're

● Top: It's rocky going as this Bucyrus-Erie 20-B loads out toe rock to a Dodge truck. Center: A general view of the quarry, source of the Prado Dam rock. Bottom: Cement is placed over the grouted rock of the outlet works, while a Bucyrus-Erie 10-B in the background continues rock placing operations.

OF DAM ROCK"

J. B. Stringfellow of Los Angeles works out some neat rock handling angles on his part of the Prado Dam job.

By FLOYD SUTER BIXBY

crazy to even try." The contractor tapped his desk top with a gnarled finger for emphasis.

"Your experience speaks for itself," he went on. "You work as hard as I do, 'J. B.', and you use good equipment. You bid your stuff right, and until five minutes ago I'd say your judgment was good. But when you say you'll make paving rock out of round boulders, I say the heat must be getting you!"

That he might be thought crazy with the heat was a trifling point indeed to J. B. Stringfellow, of Los Angeles. He wanted that rock job at Prado in the worst way, so Stringfellow merely mopped his brow and agreed with the executive that it was warm. Shortly after, he had a $600,000 contract tucked safely away and was ready to put his theory and his experience to actual test.

The rock contract for Prado Dam involves the excavation, hauling and placing in the work of some 2,000 squares of grouted rock paving 12 inches thick; 10,000 squares of ungrouted rock paving of the same thickness; 60,000 cubic yards of riprap; 10,000 cubic yards of derrickstone; and 9,000 cubic yards of concrete. While the manufacture of paving rock is perhaps the major problem, all the rest of the items presented difficulties within themselves. Paving stone, however, was the "make-or-break" item of Stringfellow's contract. Unless it was broken economically, in pieces easy to load and place in the structure, the loss from that item might have offset any possible profit from the other items.

During the past eight years, Stringfellow contracted parts of the Imperial Dam and the Gila Canal, in the desert country of Arizona, and he was familiar with the rock formations of the Southwest. The only rock suitable for paving at Prado Dam is of pre-Cretaceous age and occurs most favorably for a quarry site ten miles from the dam in the nearby mountain areas. This rock includes both the metamorphic and the massive, igneous types, and is represented by Triassic slates and Jurassic granite intrusives, respectively.

Studying the "Make-or-Break Boulders"

Near the site of the quarry was a tremendous outcrop of granite boulders — "make-or-break boulders" as Stringfellow called them. He did some experimenting with drills and wedges. Whatever the results of his experiments, they were kept strangely silent. After that, when anyone mentioned paving rock, Stringfellow just grinned like the fox in the thistle patch and said "Wait and see."

The first construction under Stringfellow's contract was 1,200 feet of the downstream toe of the dam. The specifications of the toe rock specified quarry run stone in pieces weighing up to 1,000 pounds. The stone had to be reasonably clean. Shale, clay lumps, and pieces of sound rock smaller than six inches in diameter could be present not to exceed ten per cent by weight.

Hardly any clearing or stripping was necessary at the quarry site, which had been opened about 20 years ago but was well preserved. Levelling a pile of slag and quarry spalls which had accumulated in years gone by was all that was necessary. To cast this spall pile aside and to load rock out of the quarry, Stringfellow brought in a Bucyrus-Erie 20-B shovel. He purchased it new and used it in handling 70,000 cubic yards of rock on the Gila Canal. Stringfellow swore by his 20-B, because, he said, it combined efficiency and economy of operation with actual job needs. The ¾ yard dipper being rather small, lent itself remarkably well to clean loading of trucks, even though it was large enough for rapid progress.

Although the loading process involved considerable selection of rock, the Bucyrus-Erie 20-B consistently loaded out 600 cubic yards of rock per eight hour shift.

Primary and Secondary Blasting Operations

Blasting in the main quarry was done with a Cleveland wagon drill, which drilled 3-inch holes 15

● Left: Putting a hole in a chunk of toe rock with a Sullivan L-9 jackhammer. Right: Closeup of the rock reveals the excellent cleavage obtained.

feet apart over a 40 foot face. The holes were sprung three times and then loaded with about one pound of 40 per cent Atlas powder per yard of rock to be blasted. After the first main shot, which shoved some 15,000 yards to the quarry floor, the process of breaking down the larger pieces began.

Two Model 315 Sullivan compressors with four Sullivan L9 jackhammers were brought in. The L9's took ⅞-inch octagon steel with a 1¼-inch bit, and the steel was sharpened daily in the quarry blacksmith shop with an Ingersoll-Rand drill sharpener. Holes were drilled into the larger pieces and they were usually loaded with a half stick of 40 per cent gelatine. In this manner, the large pieces were shot down to size with a resultant waste of only 10 to 12 per cent for the entire quarry.

A fleet of 12 trucks was bought to haul the rock to the dam. It consisted of 5 GMC trucks, 3 Dodges and 4 Chevrolets, all equipped with a 4½ yard dump bed. Butane fuel was used exclusively in all the Stringfellow trucks, compressors and auxiliary equipment because past experience indicated greater efficiency and economy of operation from the use of butane. The trucks ran from 60,000 miles to 70,000 miles before it was necessary to install new rings or make major motor repairs. Butane fuel was supplied by a Los Angeles distributor and operating repairs were made at the quarry by Stringfellow's mechanic.

Despite the progress on toe rock production, Stringfellow was anxious to put his paving rock theory into practice. After all, that was the part of his job which so often inspired adverse comments about the wisdom of his contract. As soon as possible, therefore, he went ahead.

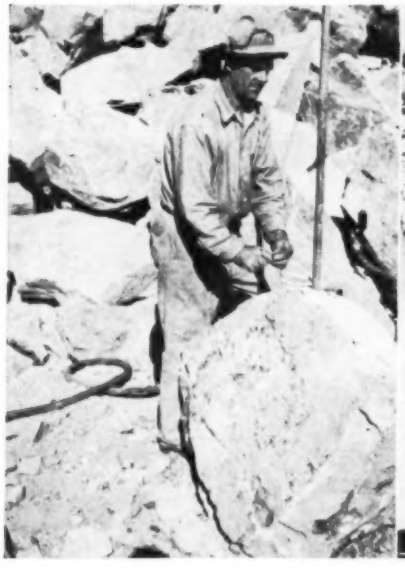
Getting Ready for the "Big Ones"

Roadways were smoothed in winding paths throughout the boulder area with an Allis-Chalmers Model "L" mounted bulldozer, so that the boulders, when broken, could easily be loaded into the trucks. A Sullivan Model 315 compressor was moved in and hose strung around the site, to be coupled to four L2 Sullivan jackhammers. A supply of short steel for drilling shallow 6 to 8-inch holes into the boulders was brought up from the blacksmith shop and a standing SOS call left there for plenty of short drills. These boulders were granite, and they were hard.

When these preparations were made, the boulders were ready for the shakedown test. A hole was drilled in the top of one of the largest "donnicks," and a quarter stick of dynamite knocked it down into five or six pieces weighing about a ton each. A shallow hole then was drilled in the top of each piece, just deep enough to accommodate the six inch long wedge. It was set in the hole between two thin steel pieces called "feathers" in quarry lingo.

The wedge was driven in with an ordinary quarry maul and after a half dozen blows a surprising thing happened. The boulder fell apart in a cleavage plane so perfect that the finished product resembled a neatly cleft cake of ice. As a matter of fact, the rancher upon whose property the boulders were broken now plans to make tombstone monuments from those remaining, after seeing how flat were the faces of rock which fell apart. But however enthusiastic his enterprise, there is little need for him to fear any possible rock shortage. He can mark each grave in Riverside County with an ornate marker if he likes, and Stringfellow can complete all his paving. After that is done there will still be millions of tons left for posterity. For the rock will stay in good shape for ages. It is bluish granite, very hard and dense, weighing from 165 to 169 pounds per cubic foot.

● **Left: Wiring the charge for a secondary blast. Right: Mr. Stringfellow watches his ¾-yard Bucyrus-Erie load out some big ones.**



Placing the Derrickstone Mat

Adjacent to the right abutment of El Prado is the outlet works which permits the normal river flow up to 9,000 cubic feet per second under the dam. Directly downstream from the concrete portion of the outlet structure passing under the dam is 1,900 feet of open river channel, with paved banks, heavily protected toe, and a derrickstone mat at the lower end. This derrickstone had to be spread six feet deep, 55 feet wide and extended 200 feet across the open channel. To place this heavy rock in the apron downstream presented quite a problem.

Trucks could not dump over such a wide area because no roadway was permitted over the apron in the interest of concrete penetration in the clean derrickstone. In order to handle the rock rapidly, Stringfellow used a Bucyrus-Erie 10-B crane which was used at Imperial Dam. It did an excel-

● Contract specifications called for a hand-finished coat of concrete to be placed over the rock in the toe cap.

lent job of swinging rock into place. Normally, the boom length was sufficient to place the rock wherever desired, but if distance was wanted, Stringfellow had an operator who could throw stone most anywhere with this little rig. This crane was also used in placing cap rock over the toe protection of the outlet channel, and will later be used to cast a rock apron below the concrete work in the outlet channel. The only labor needed was an operator and a laborer to hook the claw grab into rock to be hoisted. It handled and placed 300 cubic yards per 8 hour shift for a cost of $40.

Concrete Mix Formulas

The derrickstone at the end of the outlet channel was concreted with the following mix:

Sand	1,247 lbs.
Aggregate, ¼" to ¾"	931 lbs.
Aggregate, ¾" to 1½"	1,034 lbs.
Cement	515 lbs.
Water	36.2 gallons
Yield	1 cubic yard

Toe rock was sealed with the following concrete mixture:

Sand	1,228 lbs.
Aggregate, ¼" to ¾"	1,856 lbs.
Cement	537 lbs.
Water	40 gallons

The paving was grouted with this concrete mixture:

Sand	2,383 lbs.
Cement	794 lbs.
Water	62 gallons
Yield	1 cubic yard

Cement is furnished under the contract by the Government. Aggregates were purchased from Carl Bliss, subcontractor, who is furnishing all aggregate for concrete work in the dam. The concrete was mixed and transported in two Jaeger 3½-cubic yard mixers.

Excellent Safety Record

Thus far only one lost time injury has been suffered at the quarry or placing ends of the work. This excellent safety record is due mostly to the efforts of Stringfellow himself, who is constantly on the alert for hazards on his work. In accordance with the contract specifications, most of the labor is secured from relief rolls.

The nucleus of the organization, in addition to the boss himself, includes Earl Nutt, timekeeper, and G. A. McAfee, quarry foreman.

If Mr. Stringfellow himself reads this article, there is one part of it he will scarcely recognize, and that is the practice throughout this story of referring to him by his last name. To all who work under him, he is plain Jim. His men call him that, and he loves it.

"Jake's eyes are gettin' bigger than his dipper."

RESERVOIRS

An Excavating Engineer editor visits Carlo Bianchi and Company's reservoir excavating job near Weston, Massachusetts, and sees some interesting operations

NEAR WESTON, Massachusetts, Carlo Bianchi & Company is putting in a high-level distribution water reservoir, part of a new cut and cover aqueduct to supply the Metropolitan District of Boston from the Wachusett Reservoir. Land clearing, stripping, swamp excavation, construction of five small earth dams, building a gatehouse, and installing two types of pipe are included in the Bianchi contract.

The reservoir site covers about 70 acres, all of which was covered by timber. Clearing was done by hand, except for stump-pulling which was handled by a Bucyrus-Erie Gas Air. Work was started June 15, 1939 and has been going in high gear ever since. The entire job is scheduled for completion June 1, 1940.

Part of the contract is casting in place twin horseshoe sections of pipe, each 1075 feet long, which will run under the reservoir and carry water from the big main pipe above the reservoir to the gatehouse at its lower end. This pipe will have an inner diameter of 8 feet, 6 inches. In addition, Carlo Bianchi & Company, Inc., will install 175 feet of precast concrete pipe to connect with adjoining "main line" sections. About one foot thick, this pipe has an inner diameter of 11 feet, 6 inches. A total of about 15,000 barrels of cement will be required for the gatehouse and horseshoe pipe sections to be built on the job.

Maintenance on the job is in charge of a master mechanic. Necessary shop work is handled 8 miles from the job, in Framing-

● Out comes a brimming full bucket of heavy muck as this Bucyrus-Erie 44-B prepares to load the approaching Cat-drawn Athey wagon.

Built to Order

ham, home office of Carlo Bianchi & Company, Inc. Operations at Weston are on a 80-hour per week basis. Two 7-hour shifts five days a week, and two 5-hour shifts on Saturdays make up the schedule. One-half hour between shifts, noon and night, is used for regular greasing and inspection of all equipment.

Peter M. Bianchi is President of Carlo Bianchi & Company. Carlo Bianchi is Treasurer; Fermo A. Bianchi, Vice President. Thomas A. Coyne is Superintendent on this job.

Two Swamps Removed from Site

Total excavation, including stripping, is estimated at 300,000 yards. Of this, 10,000 yards is rock, mostly at the site for the gatehouse and the pipeline. Two good-sized swamps which had to be dug out before the arrival of Fall wet weather, provided one of the chief excavating problems. The larger of the two had a depth of 30 feet. Excavated material, from swamps and other sections of the reservoir is either stockpiled or wasted, depending on its usefulness for the earth fill dams.

The line-up of principal excavating equipment in use on the job includes:

1 Bucyrus-Erie 44-B dragline.
1 Bucyrus-Erie 37-B shovel.
2 Bucyrus-Erie Gas+Air shovels
12 to 16 Mack and Sterling chain drive trucks.
3 Athey 11-yard dump wagons pulled by Caterpillar RD8's.
3 Baker bulldozers on Allis-Chalmers "SO" 69's and a 35.
1 Ward bulldozer on a Caterpillar RD7.

When the job was visited, the 44-B dragline, swinging a 1¾-yard Red Arch bucket on a 70-foot boom, was digging out the second swamp, loading the muck to the Atheys. In this tough going, average output was between 110 and 120 yards per hour. One of the Gas+Airs, each of which use 1¼-yard dippers, was also working in the muck, loading to the 6-wheel Mack and Sterling trucks. These chain drive units were equipped with 6-yard Gar Wood and Heil dump bodies. Because of the soft going, all trucks worked with skid chains. Output for both Gas+Airs on this job averaged about 100 yards an hour. The second of these units was loading rock.

Most of the excavated material was being spoil piled at this time, with the average one-way haul running about 1500 feet. One of the Allis-Chalmers-Baker bulldozer units was spreading material as it was dumped by trucks and Athey wagons.

Pulling a Shovel Out "By Its Boot Straps"

Shortly before the job was visited, the 37-B was loading on a ledge, working in fair going. Sud-

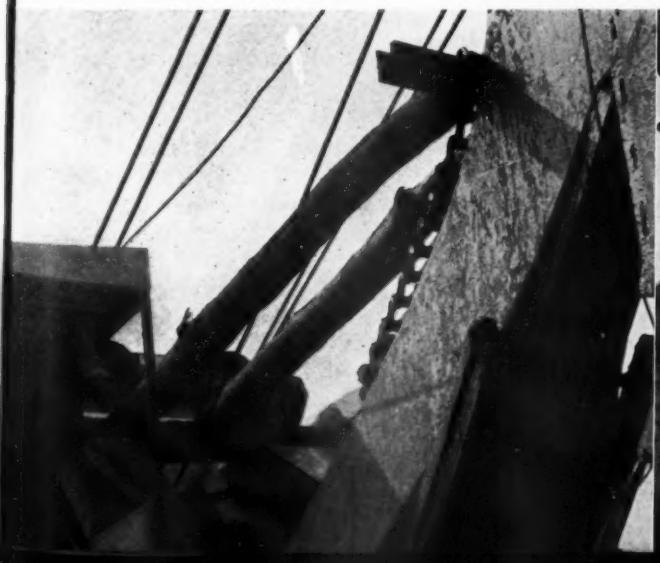
● Thomas A. Coyne, job superintendent, "bossed" the removal of two swamps and 300,000 yards of material on the reservoir site.

denly, the bank collapsed, the machine slipped off the crumbling ledge and wound up with 18 inches of clay up around its cats and five feet of water lapping at the revolving frame. The method used in getting the machine back out of the muck was one of "hoisting it by its own boot straps."

First, a sand-bag dam was built around the machine, and the water pumped out of the enclosed area. Then a rail was fastened on a lug across the boom just below the shipper shaft. A 12-inch timber was stretched across the gantry frame, and two 8-inch green oak timbers were fitted between, running parallel with the ground and in the same direction as the boom. Next the boom was pulled up snug with the boom hoist cable. The dipper and handles, operated by the crowd, were then used as a jack to lift the machine all around so log mats could be built up under the cats. It was some job, according to Superintendent "Tom" Coyne.

The only drilling necessary on

(Continued on page 74)



● Two views of the unique method used by "Tom" Coyne to free his bogged machine, showing arrangement details of the three timbers and the iron rail across the boom.

Walter S. Rae

WALTER S. RAE, nationally known contractor of Mt. Lebanon, Pennsylvania died at the age of 59 on November 16, 1939 while completing his contract on an intercoastal waterway project for the United States engineers at Myrtle Beach, South Carolina.

Mr. Rae's passing is deeply felt by a wide circle of friends and business associates who will long remember his friendly personality and his "straight shooting" tactics in his business relations.

Born in Annan, Scotland, Mr. Rae came to this country as a comparatively young man, entering the construction business in the southeastern part of the country. Through his energetic efforts he soon acquired a wide and practical experience in the construction field which aided him in the launching of his own contracting firm.

In 1907 he organized the Walter S. Rae company and his reputation for fair dealing, coupled with quality work, soon crowned his efforts with success. Mr. Rae and his company were active in many important projects, and they won national recognition for their work on the construction of the Market street bridge in Wilkes - Barre. Mr. Rae, who actively supervised this project, showed an outstanding engineering skill in overcoming the many difficulties raised by the presence of quicksand in the bridge's foundation area.

Mr. Rae's interest in the welfare of the construction industry lead him to aid in the organization of the Constructors' Association of Western Pennsylvania. His activities as president of this organization for two terms greatly increased his already wide circle of friends.

Surviving him are his widow, Mrs. Ida V. Rae, a son, Walter S. Rae, Jr., and a daughter, Mrs. Frank H. Stiening.

Frank B. Smith

THE unexpected death on December 6, of Frank B. Smith, Bucyrus-Erie large shovel sales representative in Pittsburgh, comes as sad news to his many friends and associates throughout Pennsylvania and neighboring states. Mr. Smith died when at the age of 48 after a brief three-day illness.

Born September 22, 1891 in Bloomington, Illinois, Mr. Smith obtained his early education at the local high school. Later, civil engineering studies at the University of Illinois completed his formal education.

Upon leaving the University Mr. Smith was employed on the engineering staff of the Baltimore and Ohio railroad and later on the Alton railroad in the same capacity.

Joining the Bucyrus-Erie organization in 1923, Mr. Smith soon became active in the sales division. An energetic and active worker, he established an excellent record. Because of his outstanding efforts Mr. Smith was transferred to the company's Pittsburgh office and appointed large shovel sales representative.

His many years of activity in the Pennsylvania area led to a wide acquaintance of men in the quarry, cement plant, and contracting industries and his jovial, good-natured personality cemented these friendships beyond the usual customer-salesman relations.

Mr. Smith is survived by his wife. Interment was at Litchfield, Illinois.

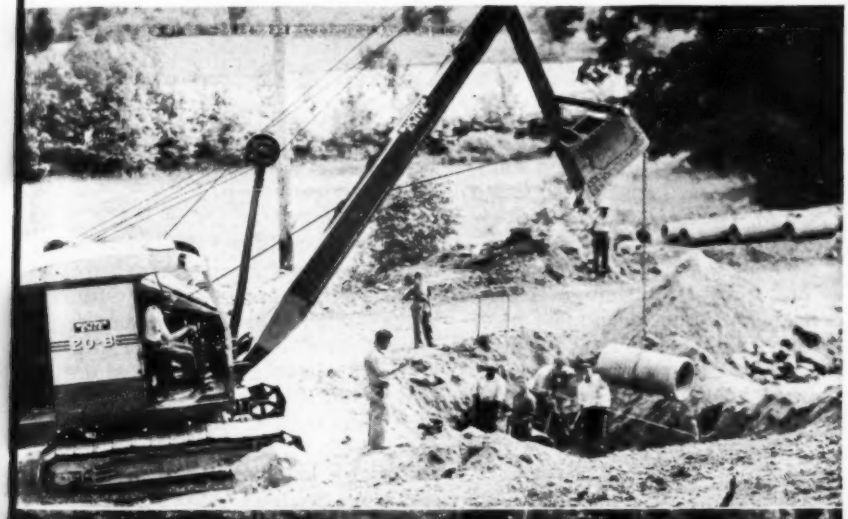
(Obituaries continued on page 73)

Modernizing NEW ENGLAND'S HIGHWAYS

A. I. Savin Construction Company completes its second successive job on the famous old Hartford-Albany Turnpike well ahead of schedule.

By SPENCER JONES

ONCE AN Indian trail, over which the Connecticut redskins trudged from the lower Connecticut river to the central Housatonic river valley and thence through the passes of the Berkshire mountains to the Hudson river, the old Hartford-Albany Turnpike is now being modernized in the most approved manner. Gone are most of the sharp turns to avoid "ye olde oake tree" (which blew down in the big wind of 1834); gone are most of the short, steep grades for which New England roads were long noted because the old road builders always preferred to go over a little circular hill than around it, or through it, never seeming to realize that the bail on a bucket is as long lying down as it is standing up.



● Top: Standing under the boom of the ¾-yard Bucyrus-Erie, Dan Barillaro, job foreman, directs the lowering of a section of concrete culvert pipe. Bottom: Pipe in place, the 20-B backfills the trench.

Two Sections Handled

Two sections of the old road, called the Winsted-Hartford Road (U. S. Route No. 44) by the Connecticut State Highway Department, have been reconstructed by A. I. Savin Construction Company, of East Hartford, Connecticut. The first project, F. A. P. 131-B (1), was completed early in 1939, and consisted of 4,082.56 lineal feet of new highway to eliminate two very bad curves and replace a 25-year old macadam pavement in the townships of Canton and Simsbury, Hartford county.

The second project, F. A. P. 131-D (1), was completed in November, 1939, and consisted of 21,561.4 lineal feet of new highway with a maximum grade of 7 per cent, to straighten, widen and replace still more of the old macadam pavement, entirely within the township of Canton, Hartford county. The two projects adjoin each other, the easterly, and first one completed, being F. A. P. 131-B (1), and the westerly F. A. P. 131-D (1).

The difficulties overcome in completing the two contracts were those encountered by every highway contractor who would like to earn a little profit out of his low bid.

The first project involved cut-

ting a deep notch through a hill of trap rock, earth and sand, and dumping the excavated material into swampy ground for roadway fill. The second project required several cuts of varying depth through trap rock, granite, earth and sand for a road more than five times as long as the first, and with a reinforced concrete instead of a gravel pavement.

Cut and Fill Operations

The first contract, F. A. P. 131-B (1), was let in July, 1938, and the deep notch through the hill of trap rock, earth and sand was bitten out by a 43-B Bucyrus-Erie shovel at the rate of 800 yards every 8 hours, and dumped for fill in the big swamp to the west. And then the pavement was put in. It was just that sort of job; adequate equipment; good management; intelligent men; and no grief worth mentioning. The 43-B was later traded in on a 1½-yard 37-B Bucyrus-Erie shovel, which is used on another job.

Nor was there any grief on the second contract, F. A. P. 131-D (1), which was let in April, 1939, and on which work was started April 19. Three hundred and fifty working days were allowed for the completion of the contract which was finished well ahead of schedule.

The deepest cut on the second project was the one through Indian Hill at the westerly end of the new road. Here 10,000 yards of rock and 14,000 yards of earth had to be removed. Loam was scraped off and stored in stock piles for other parties to place in landscaping the sides of cuts and fills.

Two Ingersoll-Rand wagon drills, an X-71 and an X-70, aided by two S-68 jackhammers, made the blast holes, drilling dry at an average speed of 6 feet an hour through trap rock and granite, and 9½ feet an hour through mica schist. Starting sizes of holes were 2¾ inches and bottom diameters were 1⅞ inches. Detachable bits were used with 1½ inch drill rods on the wagon drills and one inch on the jackhammers. The average depth of blast holes was 12 feet. Bits were sharpened at the contractor's shops in East Hartford on an Ingersoll-Rand machine and discarded after four re-sharpenings.

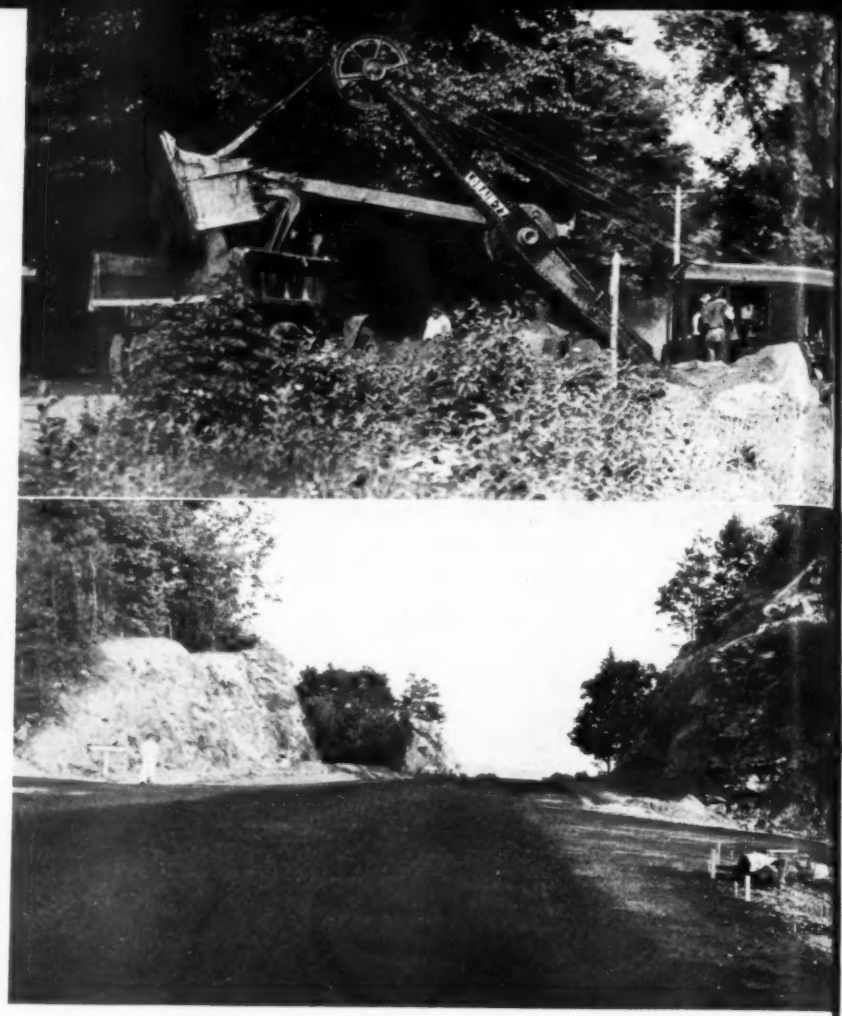
Two gasoline-powered compressors, a Gardner-Denver and a Chicago Pneumatic, supplied air at 100 pounds for the drilling.

No snakeholing was used on the second project, although snakeholes plus 25-foot-deep blast holes were both drilled on the first project in the trap rock cut.

Blast holes on the second project were spaced 4 feet back from the face of the cliff and 4 feet apart. They were loaded with Atlas 40 per cent gelatine sticks, 1½" x 8", with No. 6 Atlas blasting caps in the bottom sticks; stemmed with sand; hooked up in series, and fired with a 100-hole blasting battery.

Loading Out Blasted Material

Blasted rock and earth were loaded out by a Thew-Lorain 1½ yard and a Northwest 1½ yard shovel, both Diesel powered and equipped with 16-foot dipper sticks. The machines were operated by Dan Burns (later by Ed Malcame) and Harold Woolford.



● Top: A Lorain 77 making a shallow cut on project No. 2. Bottom: Looking east along project No. 1 through one of the job's heavier rock cuts.

Twelve Mack and Sterling dump trucks with 5-yard steel bodies hauled the excavated material from the shovels to the fill, where two model K Allis-Chalmers tractors, one with a Baker and the other with a Euclid bulldozer, did the rough levelling. Fine grading was done with an Allis-Chalmers Auto Patrol grader. The only other truck used on the job was a Ford for utility purposes.

The foundation holes for the two new bridges, the widening of the existing bridge and the new concrete box culvert were dug with a 20-B Bucyrus-Erie ¾-yard gas-powered shovel, operated at various times by Albert Latulipe and L. Greene.

This latter shovel was a sort of

(Continued on page 74)

Equipment you ought to KNOW ABOUT

Allis-Chalmers Tractors

A new line of high speed Diesel crawler tractors — powered by General Motors Diesel engines—has been announced by Allis-Chalmers Manufacturing Company. The first of this new line—the HD14—is now available and other models will be released in the near future. According to the manufacturer, the HD14 develops 130 horsepower on the belt, 106 horsepower on the drawbar, and weighs 27,000 pounds. The transmission with six forward speeds and two reverse provides forward speeds from 1.72 to 7.00 miles per hour and reverse speeds of 2.00 and 3.20 miles per hour.

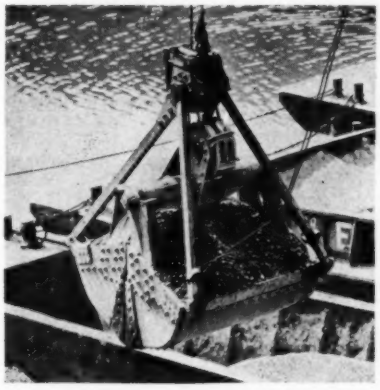
The HD14 is designed to handle the larger scrapers, 12-14 foot blade graders, bulldozers, trail-builders, rippers, winches, logging

arches, wagons, snow plows, and other auxiliary equipment. A catalog describing this new high speed Diesel tractor may be obtained from the Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin.

New Clamshell Bucket Design

A new feature in clamshell bucket design, announced by the Blaw-Knox Company, Pittsburgh, Pennsylvania, aims to reduce maintenance problems resulting from the practice of "dropping the bucket," according to a recent company release.

When digging materials that offer considerable resistance to penetration, or in excavating work, it is customary practice for the crane operator to drop the bucket with considerable force in order to insure the advantage of good initial penetration. Similar shock and impact blows also result when handling materials out of



railroad cars or barges, and in fact, the large majority of operating conditions impose impact and shock blows which may be classified as indeterminate stresses.

As a result of these impact and shock stresses, the bucket's head construction frequently becomes loose and wobbly, especially when these indeterminate stresses have to be transmitted from the head pin to the corner pins through a bolted or riveted construction.

A practical solution to this problem has been the objective of a new type of lever arm bucket recently developed by the Blaw-Knox Company. All four corner bars are mounted directly on the head pin. It is believed that this is the only single lever arm bucket on the market in which the direct communication of stresses from head pin to corner pins is accomplished without having to pass through a riveted or bolted construction.

In the assembly of this new bucket the cast steel head block, when secured in position between the two plates, joins one pair of corner bars together in such a manner that a rigid A-frame assembly is obtained. As a consequence, this improved form of construction not only provides for a direct transmittal of stress and shock between head pin and corner pins, but also insures a rigidity which maintains permanently true alignment between the upper sheaves and lower sheaves—thus obtaining a condition conducive to long cable life.

New Road Finisher

Blaw-Knox Company has developed a new gasoline road finishing machine of the double screed type, which introduces a number of improvements and distinctive features. Highlighting the new features is a unit transmission which accommodates all functions of the machine, both as to traction and screed drives.

The speed of screed stroke is

synchronized with the finisher's speed of forward travel. This feature of design prevents tearing of the surface as the machine moves ahead, it is claimed. With the objective of further increasing the thoroughness of mechanical finishing, provision has been made for screed operation while the machine is not traveling.

For the first time, the screed designs are such that structural extensions can be added in the field. A 9 inch width for the front screed and a 12 inch width for the rear screed have been retained as they have been proved advantageous for the tougher mixes now used.

Oil-IR Air-Line Lubricator

Ingersoll-Rand announces a new air-line lubricator, the Oil-IR that will operate in any position. Designed primarily for rock drill lubrication it can be used on many kinds of air operated tools, according to the manufacturer. Body construction consists of heavy steel tubing and forgings. Adjustment of the oil feed can be made without taking the pressure off the chamber and without interrupting the work. The lubricator will not "siphon back" or leak

when the air pressure is released. It can be filled in either the vertical or horizontal position.

Hercules Power Units

Hercules Motors Corporation of Canton, Ohio, announces three new models of DIX Series two-

cylinder high-speed, heavy-duty Diesel Engines and Power Units. This new two-cylinder Diesel incorporates several interesting new features and was designed for extreme simplicity, economy and reliability, according to the manufacturer. The engine has the same bore and stroke and combustion system as the Hercules DOO and DJX engines. Most of the vital parts of the new two-cylinder model are identical with the corresponding parts used in the four-cylinder DOO and the six-cylinder DJX engines.

Butler "Cement Hog"

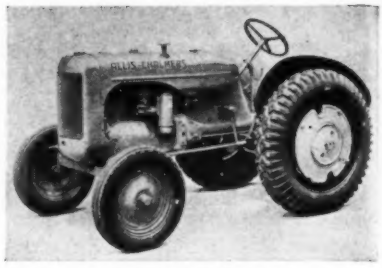
The Butler "Cement Hog" is a midget sized tractor with power operated scoop on the front, and

small enough to operate inside of a boxcar. The machine is powered by a 4 cylinder gasoline engine or electric motor.

The operator controls the horizontal movement of the machine by a foot pedal on a reversible clutch. The bucket or scoop is mounted on two arms, raised or lowered by means of an hydraulic jack and dumped by tripping a latch. Power for the jack is furnished by a pump operating from the engine or motor with a valve for controlling the raising or lowering of the bucket. One man operating the "Cement Hog" and one laborer to clean the corners, etc., can unload a 300 bbl. boxcar of bulk cement in 1½ hours, it is claimed. The unit is manufactured by the Butler Bin Co., of Waukesha, Wis.

Low Cost Industrial Tractor

A new industrial tractor, the Model "IB," has been introduced by the Allis-Chalmers Manufacturing Company. The Model "IB" is specifically designed as an industrial tractor and is built low, short, compact and powerful to handle all types of industrial work, according to the manufacturer. With 13.5 drawbar horsepower, and weighing 2140 pounds,



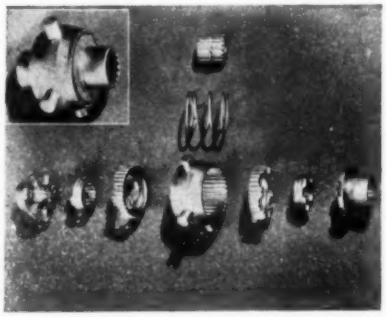
this versatile unit is said to speed up hauling operations and cut material handling costs on scores of jobs.

Because the "IB" sets low on the ground, it has the stability to haul up and down inclined ramps without tipping. A structural steel frame surrounding the engine and radiator can be provided so that extra equipment — snowplows, brooms, compressors and highway mowers—can be mounted. This frame also protects the vital parts of the tractor and serves as a bumper for pushing jobs.

Automatic Locking Differential

The Thornton Tandem Company of Detroit, Michigan, manufacturers of the Thornton Four Rear Wheel Drive for trucks are now offering the new Thornton automatic-locking Differential to truck users and motor truck producers. One of the most important facts is that the Thornton differential, a differential which operates automatically without manual assistance, is a self-contained package unit, interchangeable with standard axle differentials. The device is available for Chevrolet and Ford truck axles. Additional models are being developed for Dodge, International, General Motors, and other popular makes of truck axles.

The differential offers unusual advantages of interest to truck users. First and foremost is its



ability to eliminate wheel spinning under adverse operating conditions over uneven roads, or no

roads, and around turns due to its automatic locking principle. The use of the Thornton differential is said to permit trucks to operate efficiently in sand, mud, snow, and on ice or wet pavements since both wheels must rotate when power is applied.

Gardner-Denver Compressor

The new portable, ABY-85 utility compressor has been announced by the Gardner-Denver Company, Quincy, Illinois. According to the manufacturer, the compressor is designed expressly

for work requiring quick transport to the job and easy handling at the job. When used to operate a 45 lb. block-hole drill, the unit is ideal in a quarry where frequent moves are necessary when blasting.

Firestone's Mammoth Tires

The largest tires ever produced by the rubber industry are now being manufactured by The Firestone Tire & Rubber Company at its Akron plants. Weighing more than 2,600 pounds each and capable of carrying a load of more than 36,000 pounds apiece, these tires are in regular and exclusive production by Firestone for use on the latest types of earth moving equipment. They stand more than

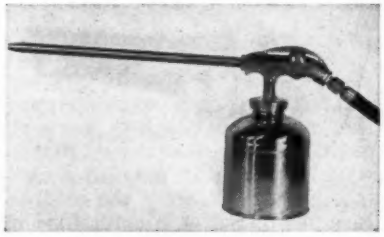
nine feet in height and have a cross section of close to three feet.

The development of large tires has made possible large size dirt moving units for large scale dirt moving operations. Without tires of this size earth moving trailers of the capacity in use today would not be possible and consequently power shovels of large capacity could not be used as advantageously as they are. Pneumatic tires are the only equipment known that will float these tremendous loads over rocky, rough ground and wet, soggy terrain.

The tube in one of these latest giant tires weighs 150 pounds and the protecting flap more than 50 pounds. It has thirty four plies of gum dipped fabric but surprisingly enough only requires 35 pounds of air. The four tires on each piece of earth moving equipment have a load capacity of 75 tons.

Oil Spray Gun

The Milburn Company, knowing that oil is undoubtedly one of the chief cogs in the smooth operation of any type of machinery, recently developed a spray gun designed for oiling springs, shackles and other automotive parts. It is equipped with an unusually long nozzle, which is of particular advantage in reaching



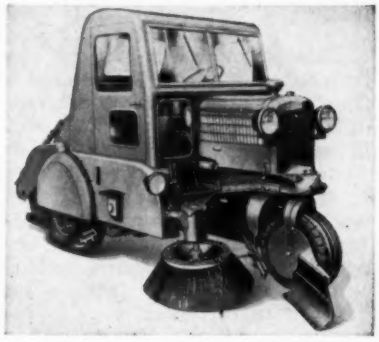
ordinarily inaccessible places. This gun is known as the Type KSC.

When not used for oiling the KSC Gun can be filled with kerosene, or any other cleaning solvent and used to remove caked grease and dirt from engines. Any desired volume may be obtained, from an almost solid stream to a finely atomized spray. The company is located at Baltimore, Md.

Enclosed Cab Available on A-W Patrol Sweepers

The Patrol Sweeper, manufactured by The Austin-Western Road Machinery Company, of Aurora, Illinois, can now be equipped with a streamlined, enclosed cab.

This cab was developed for the operator's comfort and protection since a good deal of sweeping is done at night and during cooler weather. According to the manufacturer, the operator's visibility will not be impaired because the visibility from within the cab is better than that from within an ordinary automobile. Further, the



cab is very roomy and comfortable. Two doors make it possible for the operator to enter from either side, and the upper windows in the doors can be raised and lowered at will.

Turbine Well Pumps

A new line of Turbine Well Pumps is announced by the Worthington Pump and Machinery Corporation of Harrison, New Jersey. For use in bored wells, these new units feature vacuum molded impellers—the first time this construction has been used in this type of pumping equipment, according to the manufacturer.

Wear or abrasion in the impellers is reduced to a very negligible minimum by the use of hard, high-tensile bronze, it is claimed. Available with either enclosed oil-lubricated or open water-lubricated shaft bearings, these new turbine well pumps are readily adaptable to individual local conditions. Important details of construction are illustrated in Worthington bulletin H-450-B29. A companion bulletin, H-450-B30, deals particularly with the vacuum molded impellers used in these pumps.

Heat-Treated Gears

A complete line of heat-treated gears for heavy-duty industrial application has been announced by the Westinghouse Electric & Manufacturing Company. These gears, heat-treated by the Barnes process (BP), are especially designed for long life and dependability under adverse operating conditions, such as in cranes, mine hoists, locomotives, and in rubber, flour, cement, quarrying, and metal-mining machinery.

Field NOTES

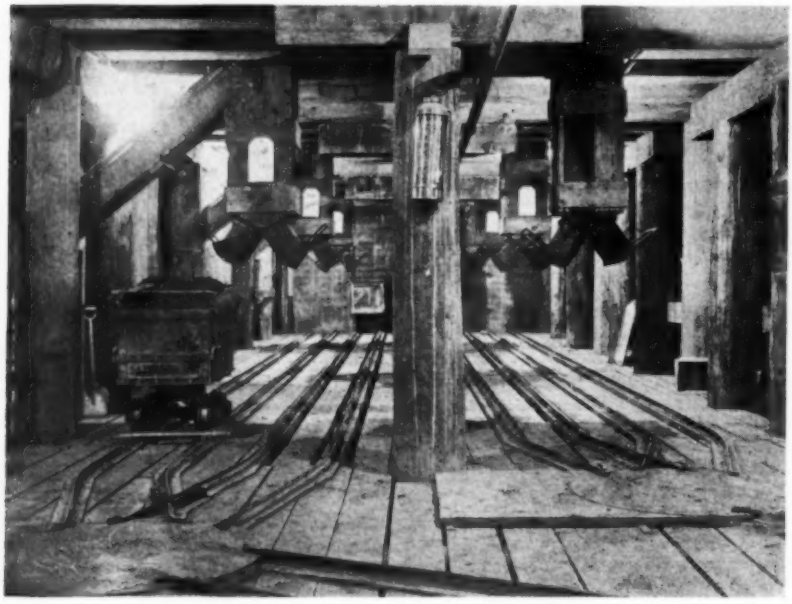
Money Saving Storage Bin System

This storage bin loading system, set up in the sub-basement of the Telephone building, Denver, during its construction, was a money saver for the Walker Construction Company, contractors. It was planned by James Howell, equipment superintendent for the firm, and may be adapted for permanent handling of sand, gravel, cinders, lime, clay and other building materials.

The materials are unloaded by gravity from truck or railroad car into several bins, supported in this instance on heavy timbers. In the sloping bottom of each bin is a metal chute, forked at the bottom end and each fork having a metal slide door. Beneath each row of chutes are two tracks for the batching cars, so that two cars may be loaded from each chute at one time. A tag hung on each chute indicates the contents, preventing inexperienced men from drawing out of the wrong bin. Each two sets of rails converge, as shown, to a turntable of heavy plate, mounted on ball bearings traveling in a groove beneath the plate. On this the cars of material are turned and routed onto any of the several tracks leading to the final destination of the materials.

—*Jos. C. Coyle.*

● A storage bin loading system that will handle free-running material conveniently and economically. Note handy turntables connecting the tracks.



Screw Jacks Provide Proper Slope for Forms

An interesting and unusual application of jacks on highway construction work in 1939 was the 222 Simplex ball bearing screw jacks used on the approach to the Meeker Avenue Bridge over Newtown Creek, Brooklyn, New York.

This 2,142 ft. approach deck is carried on concrete columns and rises at a 3.75 per cent grade up to the bridge. It has a transverse pitch of 1" in 10 ft. for drainage.

To maintain an accurate grade and transverse arc these jacks were mounted on special brackets bolted to the columns, and each jack was raised or lowered until the forms were at the desired height. The jacks supported 16-inch "I" beams, upon which the forms rested.

The caps of these jacks have a 9° "float" which took care of lateral tilt in placing the forms.

After the forms were stripped, the jacks and brackets were removed and the bolt holes grouted. Reiss & Weinsier, Inc., of Brooklyn, New York, were the contractors to whom credit is due for this novel, time and labor-saving scheme.

● Supported on special brackets bolted to the bridge columns, 222 of these screw jacks enable the contractor to conveniently provide the proper slope for his forms.

What to Do for Burns

If burned with a chemical such as an acid or a caustic, wash gently with water immediately. And use plenty of water. If possible, use running water from a faucet, hose or shower. Continue to apply water until the pain diminishes or until the doctor arrives.

For all other types of burns the first thing to do is to keep air away from the burned area—and the best thing to use is ordinary baking soda. Simply dust it on the burn through a thin clean cloth. Don't apply water. Certain salves and ointment may be used in an emergency, but usually oily or greasy substances interfere with the later treatment that may be suggested by the doctor.

If a person is burned, he may suffer more from shock than from the burn. After treating the burn, lay him on his back with his head low. Cover him and keep him warm. Don't talk to him. Hold aromatic spirits of ammonia near his nose, and rub his limbs toward the body.-*National Safety Council.*

Flexible Key Chain Makes Emergency Cork Remover

The corks in many first aid preparations are imbeded so deeply at times that the fingers cannot get sufficient grip on the protruding portion to remove them. Prying out the cork with a knife blade or other sharp tool generally results in the top of the

● Although very simple, this little trick may save you many exasperating moments with some stubborn bottle cork.

cork being cut off while the rest remains in the neck of the bottle.

When a light cork puller is not available a common ball link flexible key chain can be used to advantage. Simply lay the chain around the top of the cork, give it a half twist to tighten it and press the balls snugly into the cork and then pull the chain around in a circular movement. The balls of the chain spread the pressure contact evenly around the top of the cork and it will loosen easily and without danger of breaking off. One or two keys on the chain will help the fingers by serving somewhat in the manner of a handle. Just enough of the cork need be projecting to afford contact for the balls.

Frank Bentley.

A Contractor's Shoring Liability

An excavating subcontractor completed his work on a Philadelphia building project when he left an excavation 36 feet deep with a 12-foot slope. Eight days later, an employee of another subcontractor engaged to construct a foundation was killed through a cavein of earth and gravel.

In the widow's suit against the excavator, it was attempted to hold the latter liable on the theory that he created a dangerous condition and must share responsibility with the general contractor, who had neglected to do the shoring that was necessary to make the place safe for men working in the excavation.

In the case of Walker v. McNichol Paving & Construction Company, 189 Atl. 673, the Pennsylvania Supreme Court exonerated the excavator, because it appeared that the excavation subcontract distinctly relieved the excavator from any obligation to shore, etc.

The Supreme Court said that, if the excavator rested under any duty to make safe a dangerous condition which it had created, that responsibility ended when the excavator transferred control and possession of the job to the general contractor. The court added: "When the defendant saw the work of shoring begun, it could properly assume that the general contractor would erect adequate shoring before it permitted men to work beneath and adjacent to this wall. Certainly it is clear that defendant's duty, if any such there was under the circumstances, to remedy the dangerous condition it had created was thereupon ended."

—Arthur L. H. Street, Attorney-at-Law

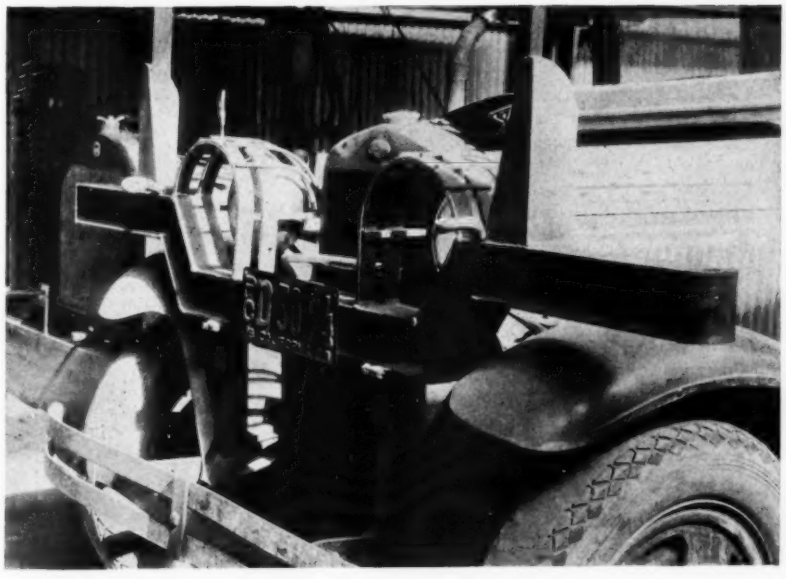
Adapting Truck for Long Steel Haulage

This stake truck, used by a Los Angeles steel firm, shows a front end adaptation which would be handy on a construction job, where reinforcing and other long material needs to be hauled on the side.

A 4-inch "I" beam is cut on a slant at four places, then welded, to give it the shape shown in the accompanying illustration to avoid interference with the headlights. It rests on two sections of channel, bent at the bottom and bolted to the chassis frame, and welded to the "I" beam at the top end. Welded shields of light bars protect the headlamps from knocks. A vertical standard of angle, welded to the top of the "I" beam just outside the headlamps keeps material from rubbing the hood. At the rear end it rests on the truck bed. When loaded, standards are inserted in holes at the end of the "I" beam, the end of which is dressed up by welding on a piece of bent plate.

—Joseph C. Coyle.

● An ordinary stake truck is converted into a useful long steel haulage unit with the addition of this "I" beam frame work.



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Road Building's Future

By CHARLES M. UPHAM

Excavating Engineer presents an exclusive and interesting forecast of road building's future trends by the Engineer-Director of the American Road Builders' Association.

The long-term outlook for highway construction improves as highway - transportation requirements become more clearly defined. The application of scientific investigation and analysis of traffic movement quite definitely shows where highway funds should be spent to meet economic demands, expanding traffic volume and highway use. This means less guesswork for highway designers and less of the uncertainty which has heretofore led to poor planning for future development.

There are several problems to be solved in the financing of highways. Opinion concerning the trend of diversion is mixed, but it seems probable that the downtrend that started in 1937 will continue, with some acceleration, through 1939 and 1940. The situation produced by the use of highway-user funds for other purposes is far from satisfactory and the wholesale use of these funds by several states for unemployment relief must be halted, in order to insure the income necessary for an adequate highway-improvement program. The states and the federal government are annually diverting about $300,000,000.

The coming Congress must vote on future federal-aid appropriations. The next allotment of $160,000,000, available the first of the year, is the last provision made for federal participation in highway construction. It seems that Congress must continue to make appropriations, according to the practice which was started in 1916. But there is difficulty here.

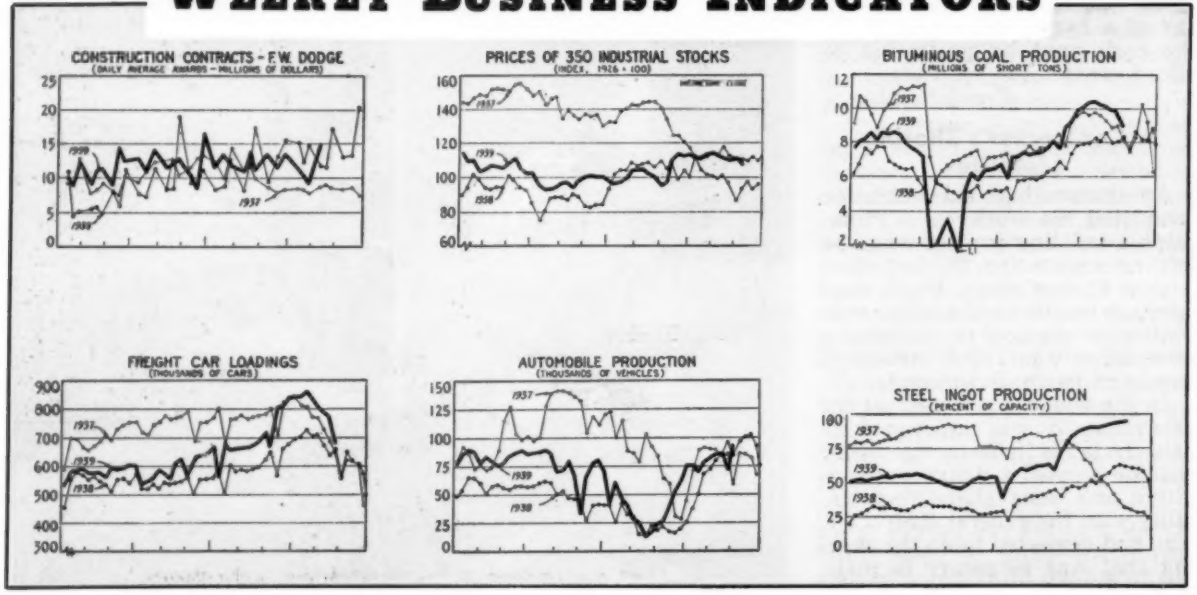
In 1938, Congress reduced the total federal allotment from $200,000,000 (1939 funds) to $135,000,000 for 1940 and $160,000,000 for 1941, due to a large backlog of unexpended federal funds at the beginning of 1938. The same condition currently exists and the chances for more liberal participation by the federal government would be better if the amount of unobligated funds was less. The states have been slow in getting work under contract, due, first, to difficulty in acquiring right-of-way and, second, to inability to match funds.

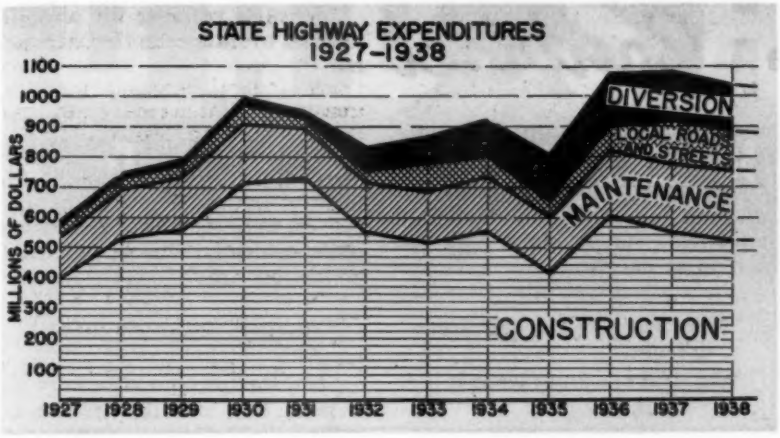
The slight downtrend in state highway construction which began in 1936 is the result of reduced federal expenditures, increasing maintenance costs, due to added mileage; less bonding and less money from local jurisdictions. On the other hand, it is quite probable that county and city programs have shown an uptrend which has more than offset the decline in state programs. There is no conclusive proof of this, but reports of highway contracts throughout the country have been sharply higher since 1936. This is the reverse of the state-highway trend and is a good indication that the slack is being taken up by counties and cities.

The obstacles to the development of much-needed highway facilities cited herein will take time to overcome. But, looking into the near future, there are several factors which tend to offset them. It is estimated that, before the end of the year, income from the gas tax will have surpassed the billion-dollar mark for the first time in history. Along with this, there should be some increase in the proceeds from vehicle-registration fees. The state highway construction expenditure for 1939 should more than hold its own over 1938, due to this increased income and an estimated reduction in diversion.

Unless there is some unforseen calamity, there should be a further increase in activity in 1940. With economic conditions steady, in-

WEEKLY BUSINESS INDICATORS





● Showing the allocation of state highway funds from 1927 to 1938 this graph portrays the rapid growth of the diversion trend between 1931 and '38.

come from highway users should continue on an uptrend, with a continued reduction in diversion. The state - highway - department construction figure could well be $75,000,000 to $100,000,000 better than 1939, contingent upon the departments expediting the expenditure of available funds.

Looking ahead a little further, the beneficial effects of the Bureau of Public Road's comprehensive report on "Toll Roads and Free Roads" cannot be overestimated. This master plan for future highway improvement was approved by the President and forwarded to Congress with the recommendation that it be considered as a basis for the solution of the nation's highway problems.

The recommendations, as set forth, are invaluable from the legislative standpoint and, inasmuch as they are based on actual survey work by the various state highway departments and the Public Roads Administration, they must necessarily be influential wherever and whenever highway development is under consideration. The report recommends the following in the development of a national highway system.

1. The construction of a special tentatively defined system of direct interregional highways, with all necessary connections through and around cities, designed to meet the requirements of the national defense, in time of war, and the needs of a growing peacetime traffic of longer range.

2. The modernization of the federal-aid highway system.

3. The elimination of hazards at highway-railroad grade crossings.

4. The improvement of secondary and feeder roads, properly integrated with land-use programs.

5. The creation of a federal land authority, empowered to acquire, hold, sell and lease lands needed for public purposes and to acquire and sell excess lands for the purpose of recoupment.

Business Rise Boosts Construction

The dollar volume of total construction contracts in November amounted to $299,847,000 for the 37 states east of the Rocky Mountains, according to statistics compiled by F. W. Dodge Corporation. This total was within one per cent of the volume of construction recorded for November, 1938, and represents a 15 per cent increase over October of 1939.

The up-swing in general business activity was reflected in contracts awarded for both commercial buildings, which rose from $13,721,000 in November, 1938 to $20,400,000 in November, and for manufacturing building, which rose from $10,534,000 to $18,481,000. The curtailment in Federal expenditures, however, caused a decline in non-residential building as a whole in November.

November, 1939, contracts awarded for residential building, 80 per cent of which reflected private-ownership construction, continued at a high rate and exceeded the volume reported for November, 1938 by 22 per cent.

Contracts awarded for public works and utilities in November exceeded the volume reported for October by 49 per cent and that reported for November, 1938 by 17 per cent. Over 60 per cent of all contracts awarded for public utilities represented private construction, a possible indication that the privately-owned utilities are gradually beginning the expansion programs which have long been anticipated.

"You're crazy, there ain't no mountain lions in this country."

NOT in the *Contract*

What a gal! We mean the one mentioned in the second paragraph on page 684 of Excavating Engineer's December issue. "Four reinforced concrete towers, consisting of an elevator, a hoist, a utility and a concession tower, will be constructed on the **dame.**"

Your editor is prepared to receive the wise crack that this type of foundation would be subject to many faults.

In Musty Gulch lived Crusty Pete,
Who never washed hands, face or feet.
The people south would often say,
"Wind's North, Pete's on the air today."

The president of a large bank recently married his secretary, who is at least a generation younger than he. The nuptials were adequately reported in the society part of a large city newspaper. But the make-up man went haywire, for the story appeared under the following headline.

"Old Power Plant Resumes Operation."

The old narrow trails where two cars could barely pass without colliding are happily being replaced by splendid wide highways on which six or eight cars can collide at one time.

There was a young lady from Trent
Who said she knew what it meant
When men asked her to dine,
Offered cocktails and wine,
She knew what it meant—but she went.

A wife paid a surprise visit to her husband's office, and, creeping up behind him, put her hands over his eyes.

"Guess who it is?" she asked gleefully.

"Stop fooling," was the reply, "and get out those letters."

Landlady (in hall talking to a gal): "I thought I saw you talking to a gentleman in your apartment last night, Miss Smythe."

Miss Smythe: "Yeah; that's what I thought, too."

"That's my wife—she can't cook—she can't sew—she can't do anything!"

"Jones is running for sheriff," yelled a bystander in the old man's ear.

"Who is he? Never heard of him," commented the deaf farmer.

"Oh yes, you have," shouted the informant. "He's a son of the bishop."

"Oh, well," quavered the ancient philosophically, "most of these politicians are."

"Teacher, may I leave the room?"

"No, Rastus, you stay here like a good boy and fill up the ink wells."

Faith: "Why do you call your boy friend 'Pilgrim'?"

Hope: "Because every time he calls he makes a little progress."

A careful driver approached a railroad; he stopped, looked, and listened. All he heard was the car behind him crashing into his gas tank.

Jackie liked to shoot birds better than doing anything else. He did it so much, however, that the town preacher decided to take a stand in the matter. "Jackie," he said hopefully, "isn't there something you'd like to do beside shoot birds?"

"Nope," Jackie replied. But the preached insisted that he think of something else. "Well, next to that," Jackie replied, "I'd like to make sling shots to shoot birds with."

That didn't satisfy the preacher, of course. After much trying, Jackie brightened up a little bit. "There is something," he said, "I like to play with little girls."

The preacher wasn't so sure about this. "Where do you play?" he asked skeptically.

"Behind the barn."

The preacher didn't lose hope. "What do you do?" he asked.

"Oh, I lift up their skirts."

"Uhhuh!" the preacher stammered. "Then what do you do?"

"Take down their pants," the boy said gleefully.

"Jackie!"

"Then I take the elastic out of their panties to make slingshots to shoot more birds with!"

ROAD SHOW • KOEHRING

ND CONVENTION

..... Come to the

1940 Road Show!

Visit Koehring Exhibit to obtain complete information about the many cost-cutting features of Koehring Heavy-Duty Construction Equipment. See the full size machines of the models illustrated here.

KOEHRING COMPANY
MILWAUKEE • WISCONSIN

CHICAGO ★ JAN. 29 *to* FEB. 2 EXHIBIT BOOTHS NOS. F-2 AND D-3

1940 Highway Forecast

(Continued from page 16)

will be carried over into the 1940 construction program. There were no highway funds diverted in 1939.

Louisiana

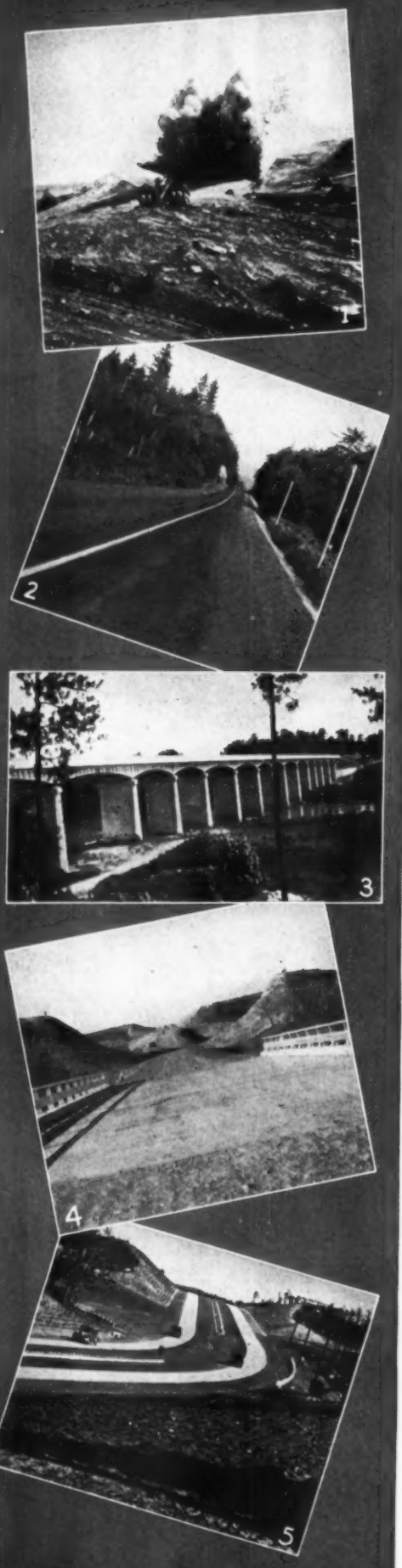
Funds available for 1940 construction in Louisiana amount to $14,986,000, of which $6,000,000 is provided by Federal allotment for construction of bridges in the floodway area. In addition, maintenance will require $3,500,000 and the purchase of equipment, $100,000. The value of construction work carried over from 1939 is $13,155,000.

Federal sources of income are: Regular aid, $3,057,829; secondary roads, $270,086; grade separations, $840,194; flood control, $6,000,000. The state motor vehicle tax will provide $4,700,000 and bonds will account for the balance of $3,718,670.

Funds earmarked for construction will be divided as follows: 140 miles of concrete to cost $6,557,329; 56.9 miles of gravel surfacing, $655,559; 37.2 miles of grading, $1,149,368; bridges to cost $6,211,000; grade separations amounting to $306,194; and roadside improvements to the extent of $107,330.

Projects included in the above list are completion of the superstructure and the paving of the approaches to the Mississippi River Bridge at Baton Rouge; widening of the Airline Highway between Bonnet Carre Spillway and Kenner; the completion of the Airline Highway between LaBarre and Carrollton Streets in New Orleans, the paving of the approaches to the new Red River Bridge at Alexandria; the completion of the embankments on Route 8 between Shreveport and Caddo Lake, between Boutte and the Mississippi River Bridge at New Orleans, between Lee and Micheaud; and the construction of numerous bridges and railroad grade separations.

Details on the construction work carried over include: 50 miles of concrete pavement, $2,163,000; 238 miles of gravel surfacing, $1,837,000; 87 miles of grading, $1,351,000; 5 bridges costing $6,469,000; 2 grade separation projects, $906,000; and 4 roadside improvement areas, $50,000.



Highway views from coast-to-coast: (1) Blasting a rock cut on a Kansas highway. (2) Completed State of Washington highway. (3) A glimpse of the South Carolina-Georgia interstate bridge over the Savannah river. (4) A Wyoming highway cuts into the hills. (5) Rhode Island's U. S. 1 is a completely modern four lane dual type roadway with a curbed center island.

Maine

The estimated 1940 highway fund for Maine will be approximately $12,400,000 representing a small increase over 1939 expenditures. Of this sum $6,200,000 is scheduled for construction; $3,580,000 for maintenance; and $2,620,000 for other expenses.

Regular Federal Aid will provide $1,800,000 of this sum; state gas taxes $5,900,000; and $4,700,000 will be furnished by state vehicle license fees and other income.

Figures on the division of 1940 construction funds were not available at this date. It is estimated that 35,000 yards of excavation previously awarded for $23,000 will be carried over into 1940.

There was no diversion of highway funds in Maine in 1939.

Maryland

An increase of 50% over 1939 funds is reported by Maryland in her 1940 roadbuilding appropriation. The 1940 fund of $21,207,875 is scheduled for the following expenses: construction, $7,087,394; primary bridge program, $8,118,170; maintenance—state and county systems, $3,116,108; and other expenses (not including Baltimore City's share) $2,886,203.

Maryland's highway funds will be derived from the following sources.

Federal Funds	
Regular Federal Aid	$ 821,369
Other, including grant	5,523,800
State Funds	
State gas tax	8,867,719
Vehicle license fees and other	5,994,988

The state's construction money

FASTER, *Smoother, More Powerful*

DIESEL TRACTOR

ALLIS-CHALMERS

HD-14

EXCLUSIVE MONEY-MAKING FEATURES TO INCREASE YOUR PRODUCTIVE TIME

1. **HIGH WORKING SPEEDS** — cut round trip time and lengthen profitable haul distances.
2. **POSITIVE-SEAL TRUCK WHEEL ASSEMBLY** — requires lubrication only once in 200 hours.
3. **NEW "LONG-WEAR" BIMETAL-LIC BRAKES** — greatly reduce time-out for repairs.
4. **NEW "LONG-WEAR" BIMETAL-LIC STEERING CLUTCHES** — outlast ordinary clutches by several hundred hours.
5. **GENERAL MOTORS 2-CYCLE DIESEL ENGINE** — proved by 25,000,000 miles of heavy-duty railroad service.

You've NEVER SEEN ANYTHING LIKE IT. Never before a tractor with 108 Drawbar h.p. . . . and with speeds up to 7 m.p.h. POWER . . . FLEXIBILITY . . . SPEED . . . in a combination never before possible in a crawler tractor.

A 2-cycle Diesel engine free of the handicaps of ordinary Diesels . . . field tested under every conceivable soil and climatic condition. On long continuous operations . . . we gave it the works . . . tried to break it down. It met every gruelling test on every job . . . as it will on yours. You'll be as proud of it as we are. Try it . . . see for yourself. Ask your Allis-Chalmers dealer to show you what it can do . . . on your job . . . NOW.

NO EXTRAS TO BUY—Standard equipment includes electric starter and lights, muffler, radiator guard, crankcase guard, front pull hook, bumper, hour-meter, radiator shutters, fenders and heavy truck wheel guards.

SPLIT-SECOND ELECTRIC STARTING
Starts right now! No fuss, no bother . . . press the button — it goes to work!

PROVED BY OVER 1,000,000 CUBIC YARDS OF MUD, SAND AND ROCK

To test the HD-14, 16 of them were put on jobs with varying climatic and soil conditions — on mud and sand in the hot Rio Grande Valley . . . on Midwest gumbo . . . on Pennsylvania Turnpike shale . . . on logging in high altitudes of West Coast woods. These outfits moved more than a million yards of dirt, proved themselves to be the easiest-starting, fastest-moving track-type Diesel tractors in the world today.

ALLIS-CHALMERS *Faster* **DIESEL** *Power*

TRACTOR DIVISION — MILWAUKEE, U.S.A.

● Breaking ground for a highway near Elkton, Maryland, these two Gar Wood scrapers, equipped with U. S. Royal Earth Mover tires, are put to work by the John Ensey Company of Baltimore.

is to be allocated in the following manner:

	Miles	Amount	Quantities Required
Grading	85.63	$ 600,000	1,700,000 yds.
Surfacing			
Gravel or crushed stone (bituminous)	26.16	96,000	110,000 tons
Oil treatment	750.00	400,000	
Paving, high type	48.47	400,000	
Paving, low type	11.00	45,000	
Bridges (25)		10,168,170	
Grade eliminations (11)		1,210,200	

In addition to the above work, about 1,815,100 yards of highway excavation is being carried over into 1940 at a price of $816,800.

During 1939, $1,784,000 of Maryland's highway funds were diverted to the state's General Fund.

Massachusetts

A total 1940 highway allotment of $11,675,000 is reported for Massachusetts by R. W. Coburn, Chief Engineer. The funds will be made up of $3,300,000 in Federal aid; $600,000 in other Federal funds; and $7,775,000 from state gas tax and vehicle license fees.

Construction funds will cover the following types of work: 2 miles of grading, 28 miles of high type paving, 1 mile of low type paving, and 30 bridges. Excavation previously awarded and carried over into 1940 amounts to 360,000 yards.

No highway funds were diverted in Massachusetts during 1939.

Michigan

An $8,000,000 state highway construction program has been outlined for 1940 by Commissioner Murray D. Van Wagoner. A major portion of this work will be based on Federal Aid funds.

Michigan's 1940 construction program will include the following: regular Federal Aid roads $5,420,000; secondary roads $596,455; grade crossings $649,147; state trunk lines $977,000; bridge construction $184,000; and forest highway projects $168,694.

Highway department officials estimate a 10% increase over 1939 in highway expenditures.

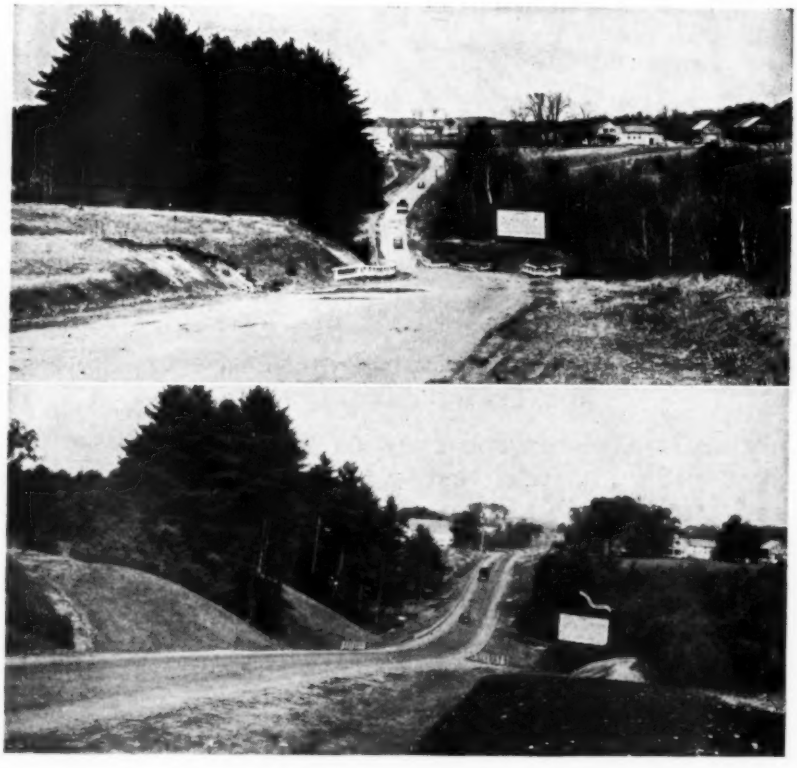
Constitutional amendment forbids the diversion of highway funds in Michigan.

Minnesota

With the highway budget reduced by $1,600,000 from last year's total, Minnesota will have $26,009,091 available for 1940 highway work.

Construction allocation is $11,300,858; maintenance, $8,208,480; other work, $6,499,752. Construction funds will be divided into 510 miles of grading requiring 17,000,000 yards of material, $5,419,216; 90 miles of gravel surfacing using 70,000 tons of material, $180,000; 60.2 miles of oil treatment taking 700,000 gallons of material, $380,440; 90 miles of high type paving costing $2,157,400; 44 miles of low type paving, $193,280; 39 bridges totalling $2,823,491; and 11 railroad crossing signals to cost $59,700. In addition

● Above: A dangerous curve and dip on Maine's U. S. 201 was neatly straightened as shown below.

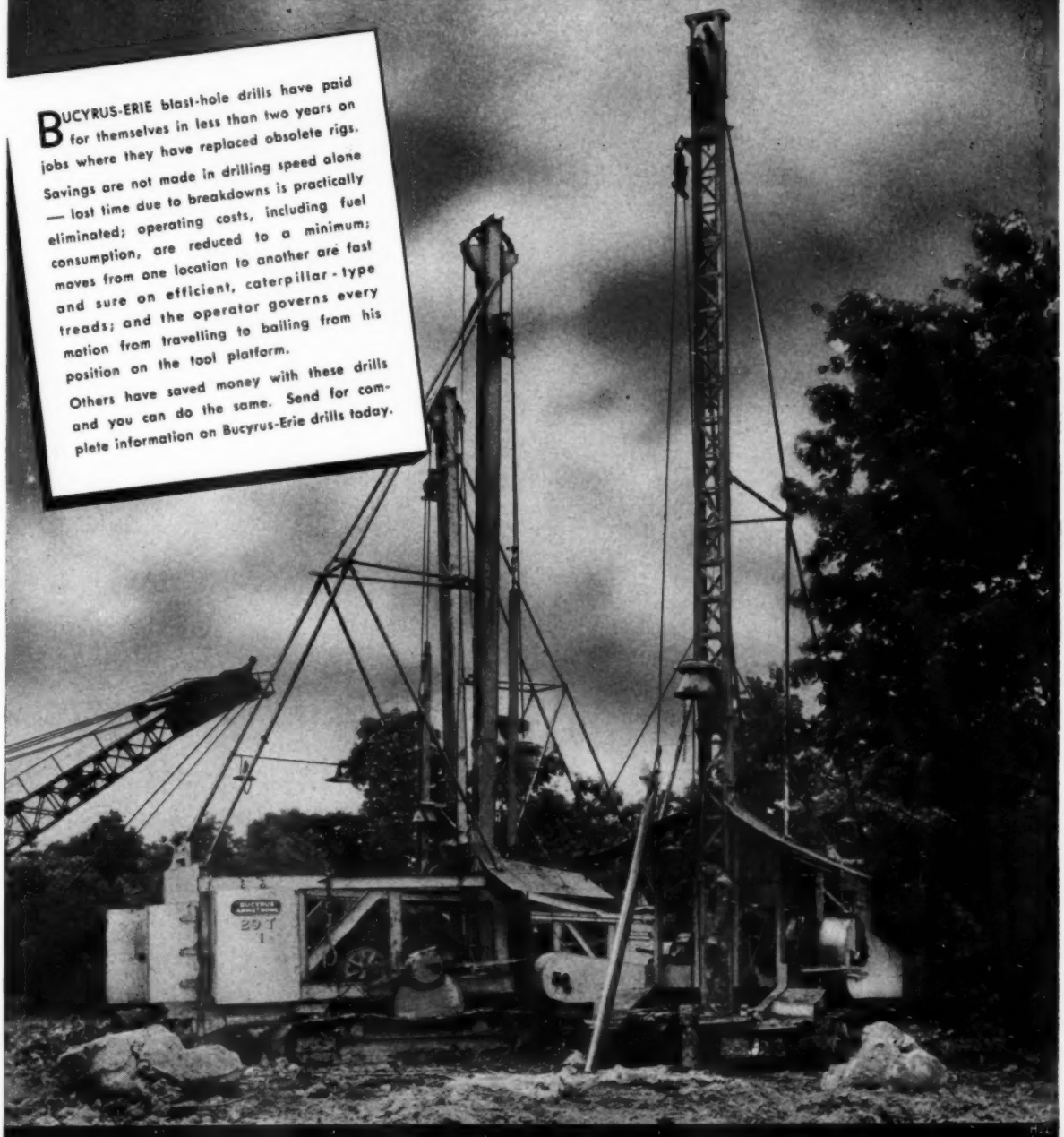


MODERNIZE

And Increase Your Profits

BUCYRUS-ERIE blast-hole drills have paid for themselves in less than two years on jobs where they have replaced obsolete rigs. Savings are not made in drilling speed alone — lost time due to breakdowns is practically eliminated; operating costs, including fuel consumption, are reduced to a minimum; moves from one location to another are fast and sure on efficient, caterpillar-type treads; and the operator governs every motion from travelling to bailing from his position on the tool platform.

Others have saved money with these drills and you can do the same. Send for complete information on Bucyrus-Erie drills today.



BUCYRUS-ERIE COMPANY

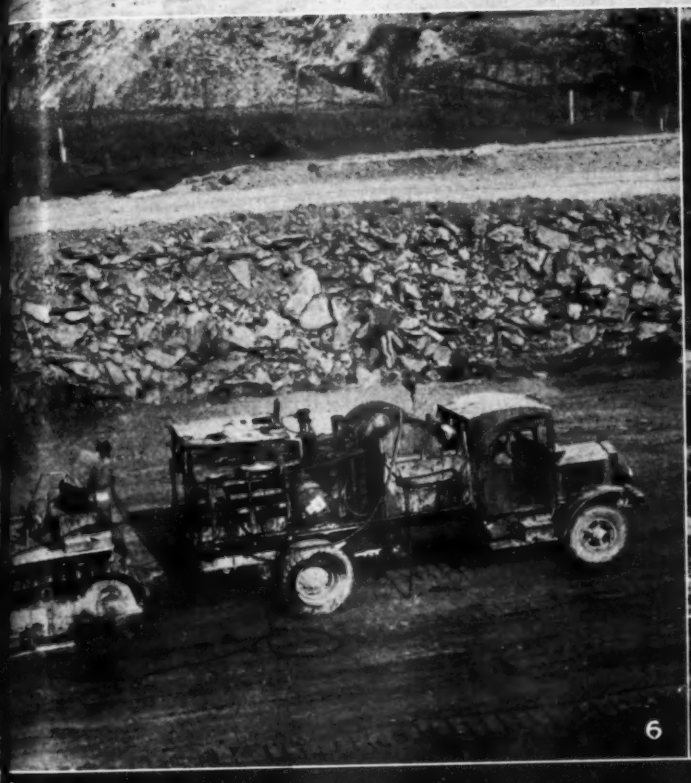
SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

Building Tom

(1) "Steel carpenters" install a bridge floor at Cleveland, Ohio, with Lincoln arc welding equipment. (2) A modern divided four-lane highway leads into twin bridges in Virginia, State Chamber of Commerce photo. (3) Du Pont explosives provide aggregate for highway construction at the Dyer Quarry Company's Birdsboro, Pennsylvania plant. (4) Back sloping a Colorado highway with a Caterpillar motor grader.

...rrow's Roads



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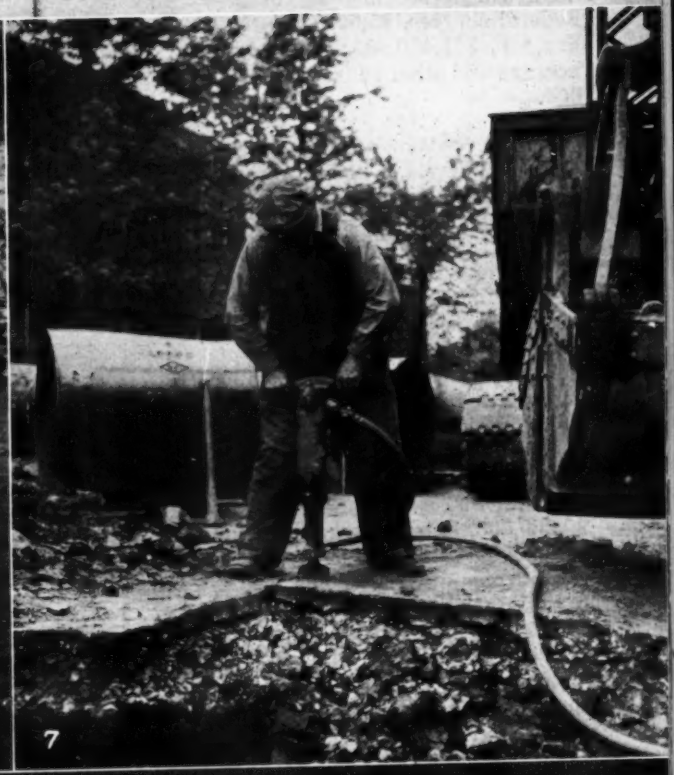

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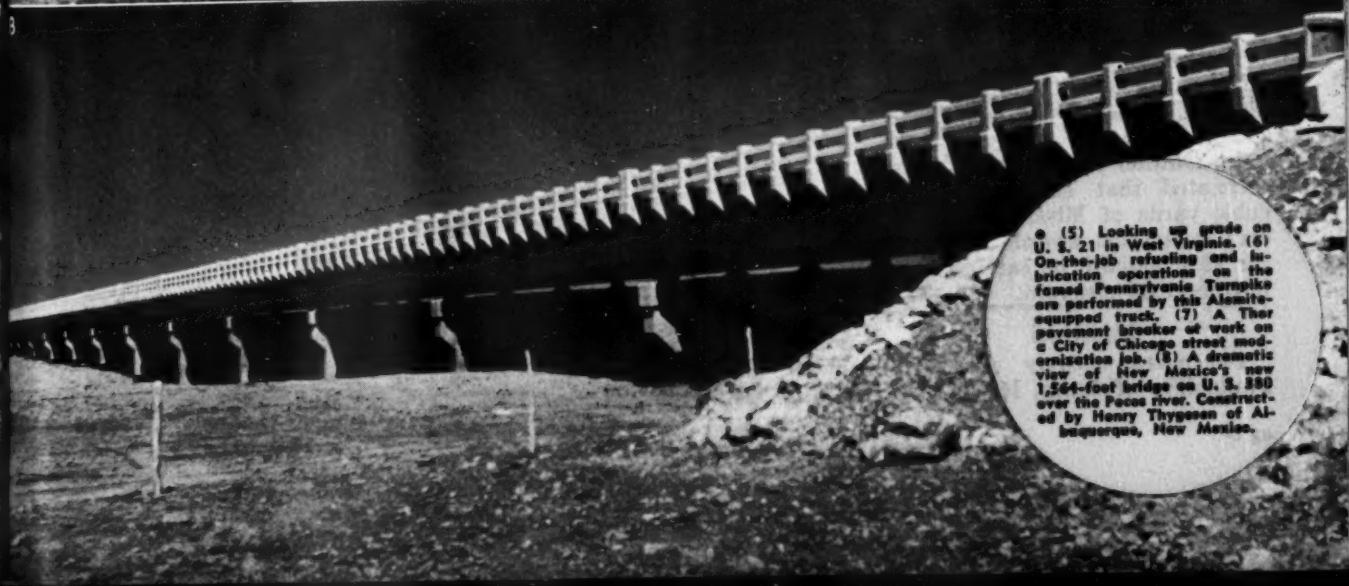
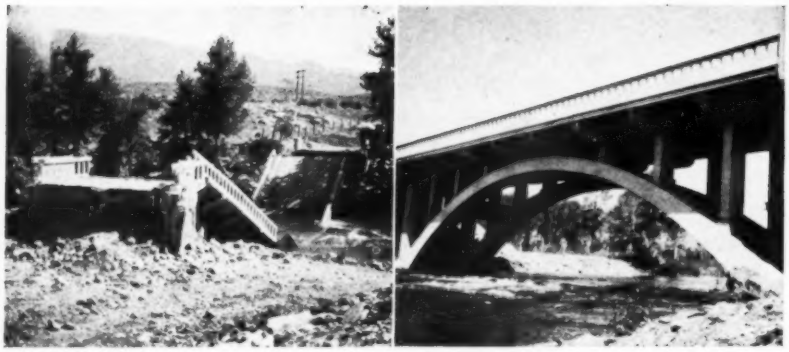


● (5) Looking up grade on U. S. 21 in West Virginia. (6) On-the-job refueling and lubrication operations on the famed Pennsylvania Turnpike are performed by this Alemite-equipped truck. (7) A Thor pavement breaker at work on a City of Chicago street modernization job. (8) A dramatic view of New Mexico's new 1,564-foot bridge on U. S. 380 over the Pecos river. Constructed by Henry Thygesen of Albuquerque, New Mexico.



● Left: This old bridge on Nevada's U. S. 40 was blown up to make way for (Right) a modern single arch structure.

about 1,000,000 yards of excavation awarded in 1939 will be carried over into 1940.

Funds for the program as outlined will be obtained as follows: Federal sources, $5,059,091; state gas tax, $11,450,000; and vehicle licenses and other sources, $9,600,000.

Mississippi

R. A. Harris, Chief Engineer, reports that Mississippi will have about $13,500,000 available for highways in 1940. This sum represents approximately a 50% decrease under 1939 expenditures. Of this amount $12,000,000 has been earmarked for road construction activities with the balance going for highway maintenance.

The major part of Mississippi's 1940 road funds will be derived from state vehicle license fees and bonds. This sum, amounting to $9,000,000, is to be augmented by $1,500,000 from state gas tax receipts remaining after the financing of state highway bonds.

Mississippi reports no diversion of her 1939 funds and present budget allocations point to a continuance of this policy for 1940.

Highway construction operations for the coming year include about 150 miles of grading calling for the handling of about 3,500,000 yards of material. About 600 miles of surfacing operations are planned, including all types of surfaces.

In addition to the above, it is estimated that about 2,500,000 cubic yards of Mississippi highway excavation awarded in 1939 for $550,000 will be carried over into the 1940 program.

Missouri

Dependent entirely upon the availability of funds, Missouri is planning the following highway program for 1940:

	Miles
Concrete	100
Bituminous (incl. .17 miles of oil treatment)	160
Granular	150
Grading and drainage	60
Total	470

Estimated cost for this proposed program is $10,800,000.

During 1939 Missouri awarded the following work:

	Miles
Concrete	69.1
Bituminous (incl. 4.5 miles of oil treatment)	128.8
Granular	235.7
Grading and drainage	67.9
Total	501.5

Contract cost of this program was $7,550,000 (plus 10%).

Revenues in Missouri are derived chiefly from a 2 cent gasoline tax, motor vehicle fees and Federal Aid. Bond retirement and interest during 1939 consumed approximately 40% of all state revenue received.

By constitutional amendment no diversion of state highway funds is permitted in Missouri.

Montana

According to W. O. Kivley, State Office Engineer, Montana will have $7,900,000 available for her 1940 highway program. This sum represents an approximate decrease of 18% under 1939 expenditures.

Montana will spend $5,100,000 of these 1940 funds in the construction of new roads, while $2,100,000 will be spent on the maintenance of her present highway system. A balance of $700,000 has been set aside for other activities in the highway program.

Construction funds are to be used for the following purposes: 225 miles of grading requiring 5,000,000 yards of material, 340 miles of gravel or crushed stone surfacing calling for 2,000,000 tons of aggregate, 200 miles of oil treated surfacing requiring 4,500,000 gallons of oil, and 100 state road bridges are to be constructed at an estimated cost of $800,000.

Approximately 2,000,000 yards of highway excavation awarded in

● Louisana's most important current project is the construction of this $10,155,920 bridge across the Mississippi river at Baton Rouge.

FEDERAL AID SECONDARY OR FEEDER ROAD PROJECTS
AS OF OCTOBER 31, 1939

STATE	COMPLETED DURING CURRENT FISCAL YEAR			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR PROGRAMMED PROJECTS
	Estimated Total Cost	Federal Aid	Miles	Estimated Total Cost	Federal Aid	Miles	Estimated Total Cost	Federal Aid	Miles	
Alabama	$ 197,905	$ 97,650	17.2	$ 942,462	$ 383,350	25.6	$ 30,200	$ 15,100	6.8	$ 789,156
Arizona	150,487	108,529	16.5	147,395	105,786	16.9				325,941
Arkansas	765,480	612,922	65.7	183,579	178,910	22.7	73,469	73,414	6.5	151,875
California	662,750	357,967	34.9	499,961	245,274	14.0	191,095	102,335	4.3	651,077
Colorado	518,727	265,180	19.5	478,290	269,039	14.0	36,596	20,626	3.1	31,948
Connecticut				172,794	72,417	2.9	108,041	37,810	.2	251,419
Delaware	80,840	40,420	17.5	71,661	35,831	7.8				232,384
Florida	194,117	96,700	7.3	795,505	393,394	30.3	7,358	3,679		371,271
Georgia	226,952	111,740	28.0	269,282	134,641	31.3	129,939	64,970	18.1	1,072,324
Idaho	214,675	129,195	22.9	319,386	163,267	25.8	130,982	70,634	9.3	73,778
Illinois	841,207	417,975	31.3	1,179,200	529,608	87.8	356,700	177,050	21.0	551,933
Indiana	489,000	244,500	41.7	714,596	356,094	54.3	112,122	56,050	9.4	631,614
Iowa	24,095	11,069	22.9	546,140	257,335	52.5	868,031	406,700	148.3	1,004,703
Kansas	56,428	28,214	26.1	183,802	91,901	20.5	340,325	170,161	7.3	1,291,203
Kentucky	445,912	143,463	44.0	1,057,612	299,582	54.3	521,864	181,918	49.8	223,613
Louisiana	471,353	215,553	41.5	348,970	166,888	27.0	358,993	166,352	29.0	283,778
Maine	324,403	162,130	18.6	161,120	79,474	9.4	19,700	9,850	1.2	9,072
Maryland	204,891	98,787	16.0	80,696	23,048	2.5	186,000	63,355	11.7	350,491
Massachusetts	101,519	50,435	2.4	507,052	251,158	11.1	49,200	24,525	1.6	463,550
Michigan	430,989	209,952	44.7	1,367,782	681,391	95.3	170,000	85,000	10.3	760,511
Minnesota	513,256	254,584	35.3	588,696	294,348	73.8	97,458	48,729	23.4	1,060,844
Mississippi	176,500	88,250	6.8	785,262	396,346	60.7	67,500	33,750	17.0	632,520
Missouri	645,117	311,688	96.0	720,758	342,330	67.3	138,612	52,437	25.8	561,273
Montana	468,607	265,790	48.6	381,003	216,037	23.0	59,718	33,872	6.6	816,329
Nebraska	464,642	222,306	88.3	823,370	404,510	144.7	139,699	69,850	25.4	319,657
Nevada	160,893	136,525	25.0	70,067	60,261	18.1				145,070
New Hampshire	61,156	29,708	2.4	83,280	39,815	3.1				150,441
New Jersey	255,320	125,610	7.1	295,020	146,820	17.3	24,500	12,250		509,585
New Mexico	466,270	286,858	42.1	27,020	15,690		361,210	146,391	26.9	80,519
New York	918,636	454,559	45.9	2,393,105	1,149,608	86.7	273,200	95,750	4.1	229,233
North Carolina	711,294	355,625	57.7	725,030	362,515	73.7	35,240	12,500	2.3	316,205
North Dakota	115,030	61,606	8.3	37,500	20,100		111,270	59,617	10.9	819,207
Ohio	230,820	115,410	15.2	900,170	455,550	39.9	802,000	401,000	27.8	1,323,392
Oklahoma	81,838	38,943	.8	336,696	179,153	16.8	470,655	250,428	36.9	858,921
Oregon	551,886	310,902	59.9	271,962	126,380	31.2	14,696	8,820		292,800
Pennsylvania	1,905,307	940,977	109.3	1,096,322	542,056	38.5	370,074	185,037	13.3	211,879
Rhode Island	93,827	46,890	2.2	81,236	40,618	.2	36,060	18,030	.4	78,277
South Carolina	562,159	228,890	56.9	22,620	10,179		303,500	126,600	22.2	220,251
South Dakota	3,830	2,100	4.0	23,396	12,878					1,043,072
Tennessee	732,508	313,954	27.1	226,796	113,398	5.3				759,186
Texas	1,735,044	856,416	198.2	887,272	428,005	83.9	313,260	135,950	40.9	899,503
Utah	190,570	110,765	30.2	48,830	24,098	9.2	115,770	44,000	5.2	153,199
Vermont	126,051	62,026	4.5	187,872	61,587	7.3				52,851
Virginia	525,334	255,171	57.3	232,980	114,854	14.4	310,590	136,228	17.9	172,598
Washington	473,395	247,383	26.0	290,290	151,918	22.9	103,829	53,400	11.2	215,301
West Virginia	145,150	72,575	8.3	13,015	6,507		203,901	101,951	10.8	411,464
Wisconsin	523,087	260,059	27.1	591,300	295,162	9.3	471,585	221,418	7.3	473,606
Wyoming	464,992	288,144	26.0	159,218	100,513	10.3	112,112	65,156	19.6	64,172
District of Columbia	90,660	45,330	3.7	101,892	50,446	1.1	15,800	7,900	.2	14 779
Hawaii				205,590	102,795	4.6	179,480	89,705	6.4	82,170
Puerto Rico				224,464	109,130	12.8	55,188	27,140	2.1	60,233
TOTALS	19,794,909	10,191,485	1,638.9	22,859,317	11,091,995	1,482.1	8,877,522	4,167,438	702.5	22,490,178

● A GMC-mounted Fruehauf trailer feeds a bituminous surfacing mixture to a Barber-Greene asphalt paver on an Illinois road paving job contracted to the Rock-Road Construction Company of Chicago.

1939, or before, will be a $400,000 addition to the 1940 program.

Montana's 1940 funds are made up of $3,000,000 received from the regular Federal Aid program with state funds of $4,700,000 in state gas taxes and $200,000 other income completing the balance.

There was no diversion of highway funds in Montana during 1939.

Nebraska

While 1940 highway allocations have not been completed for Nebraska, A. C. Tilley, State Engineer for the Department of Highways estimates that the program will be about the same as carried on in 1939.

Construction work completed in 1939 approximated $6,900,000 and covered 422 miles of grading; 386 miles of gravel surfacing; 302 miles of bituminous pavement; and 23 miles of concrete pavement. It is expected that 1940 will see a reduction in grading mileage and an increase in the mileage of pavement. In addition to the above, 1939 work included $3,000,000 for maintenance.

Sources from which money will be available are: Regular Federal Aid, 32%; State gas tax, 58%; and vehicle license fees and other sources, 10%. It is estimated that 3,000,000 cubic yards of excavation will be carried over into 1940.

Nevada

An increase of 20% is expected in the expenditures of the Nevada State Highway Department, according to H. D. Mills, Assistant State Highway Engineer.

Nevada's $1,760,000 1940 highway fund will be allocated in the following manner: construction $600,000; maintenance $850,000; and other expenses $310,000.

Sources from which this money will be obtained are: regular Federal Aid $2,230,000; state gas tax $1,400,000; and vehicle license fees and other income $360,000.

Final allocation of 1940 construction funds had not been made at this writing. It is estimated that 1,400,000 yards of excavation previously contracted at $33,000 has been carried over into 1940.

No highway funds were diverted in Nevada in 1939.

New Hampshire

Highway funds available in New Hampshire for 1940 are expected to reach $6,690,400 according to reports of state highway officials. Of this amount $1,960,400 will be used for construction; $3,330,000 for maintenance; and $1,400,000

● Merry and Cullen of Fairdale, Illinois, produce limestone for road surfacing purposes. Their small, but modern, plant includes a Buda-Lanova Diesel-powered conveyor belt and an Insley shovel.

1. A made reinforced concrete overpass near Jennings, Louisiana. (2) St. Croix County, Wisconsin produces aggregate with a Sauerman Crescent bucket. (3) Baldwin Brothers of Cleveland put in a safety highway near Greensburg, Penna. with a Koehring Twinbatch paver. (4) U S 40's new location in Utah cuts out some bad curves

● A ¾-yard Bucyrus-Erie loads base course surfacing to a truck near Thoreau, New Mexico, for state road maintenance work.

for other charges including operation and financing service. These amounts run about the same as 1939 allotments.

The above expenditures are to be covered by the following: regular Federal aid $487,000; other Federal funds $133,000; state gas tax, $2,550,000; and vehicle license fees and other income $2,960,000.

Figures on the definite assignment of these funds were not available at time of publication. No highway funds were diverted in New Hampshire in 1939.

New Jersey

New Jersey's 1940 highway program is dependent upon the decision of its state legislature which goes into session the second week of this month.

However, a recent highway recommendation report submitted to Governor A. Harry Moore by State Highway Commissioner E. Donald Sterner gives some idea of the probable 1940 program.

A sum of $11,816,632 was recommended by Commissioner Sterner for 1940 construction to be used as follows: $4,678,632 strictly department projects; $3,038,000 Federal Aid projects; and $4,100,000 as the state's share toward WPA projects.

Anticipated 1940 revenues were listed by Commissioner Sterner as follows: motor vehicle fees and fines $20,000,000; motor vehicle inspection fees $965,000; bus excise taxes $85,000; motor fuel taxes $23,000,000; Federal aid $1,519,000; and miscellaneous receipts $300,000.

According to this report, however, these anticipated revenues will be reduced to $43,069,000 as the result of an anticipated $3,100,000 deficit for 1939 attributed to legislative relief financing action. A total of $2,000,000 of the 1940 highway funds is already earmarked for diversion to unemployment relief financing.

New Mexico

B. G. Dwyre, State Highway Engineer, reports that New Mexico has $12,192,000 available for her 1940 highway program. This fund, which is about the same as last year, will be assigned in the following amounts: construction $9,742,000; maintenance $1,600,000; and other work $850,000.

These highway funds will be made available from the following sources:

Federal Funds—	
Federal Aid	$1,826,000
F. A. Secondary roads	238,000
F. A. Grade crossings	251,000
Public lands	163,152
Other (1940 and prior)	2,700,000
State Funds—	
State gas tax	2,200,000
Vehicle license fees and other	3,800,000

Construction plans for 1940 call for the following: 70 miles grading and drainage, 130 miles gravel or crushed stone surfacing, and 200 miles oil treatment or oil process surfacing.

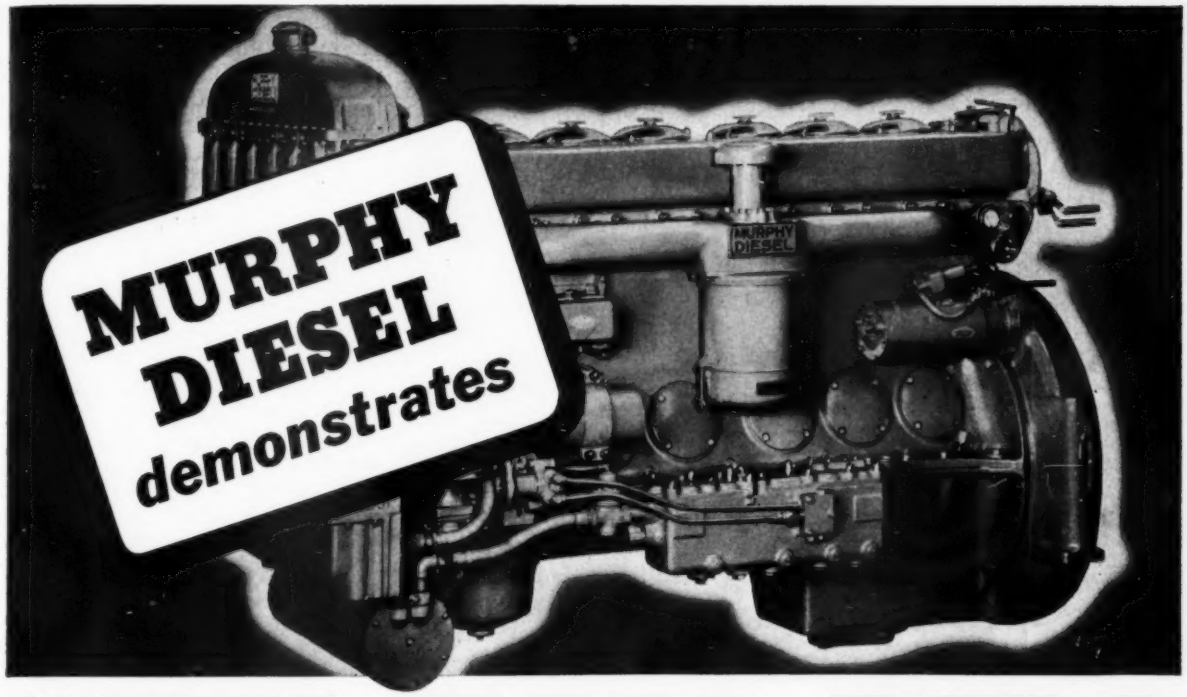
In addition to the above, 3,232,317 yards of excavation, including unclassified, structure and pipe culvert, will be carried over into 1940 at an already awarded price of $451,545. New Mexico reports no diversion of funds for 1939.

New York

As New York's governor does not present his highway budget to the state legislature until January 15, 1940 this state's figures were not available at press time.

Available, however, are 1939 allotments. Combined Federal and state funds for 1939 totaled $19,587,782 for 254.08 miles of road-

● Fill for the construction of a super highway near Elizabeth, New Jersey, is being taken from a borrow pit by a Lorain shovel loading to Sterling chain drive dump trucks in the service of Santaniello Brothers, Inc., of Jersey City.



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[Diesel Engine Lubricating Oil]

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The California Company (Montana only)
Humble Oil & Refining Company
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Standard Oil Company of California
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Utah Oil Refining Company

Diol "RPM" DELO:
The Carter Oil Company, Tulsa, Oklahoma
Colonial Beacon Oil Company
Standard Oil Company of Louisiana
Standard Oil Company of New Jersey
Standard Oil Company of Pennsylvania

Kyso "RPM" DELO:
Standard Oil Company (Inc. in Kentucky)

Signal "RPM" DELO:
Signal Oil Company

Sohio "RPM" DELO:
The Standard Oil Company (Ohio)

IN CANADA AND NEWFOUNDLAND

Imperial "RPM" DELO:
Imperial Oil Limited

IN BRITISH COLUMBIA AND ALBERTA

"RPM" DELO:
Standard Oil Company of British Columbia Limited

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"RPM" DELO is available through distributors in more than 100 countries.

gives complete protection in tests far tougher than actual operation!

Says Murphy Diesel Engine Company:—"Our own laboratory tests *proved* that NEW RPM DELO will *stand up* and *protect* engines under conditions much more severe than ever encountered in the field!"

What does that mean? Long, peak-load hours—giving New RPM DELO the hardest punishment field operation ever could require—then devising tougher tests that went *far beyond* any field service needs.

And New RPM DELO *took it*—kept cylinders clean—kept rings free—kept oil filters clean—and showed not the least sign of corrosion on bearings. Carbon and sludge?—there weren't any!

Let New RPM DELO assure *you* better Diesel performance and more profitable operation.

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New "RPM" Diesel Engine Lubricating Oil now available everywhere in the gray barrel with the blue head

RPM
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DIESEL ENGINE LUBRICATING OIL

Unequaled
FOR EVERY DIESEL

STANDARD OIL COMPANY OF CALIFORNIA

For your convenience in writing to Standard Oil Company of California, you will find a card bound in this issue.

● "Sandhogs" at work in New York's Queens-Midtown tunnel. Safety measures on this project include the wearing of M. S. A. Skullgard protective hats.

ways and were made up of the following:

Miles	Project	Amount	N.Y. or Fed. Per Cent
171.53	highways	$10,998,395	{ 50 N.Y. { 50 F.A.
13.32	highways	1,024,797	100 N.Y.
6.73	grade crossings	2,825,629	100 F.A.
4.34	grade crossings	1,113,700	100 N.Y.
48.24	farm-to-market	1,983,755	{ 50 N.Y. { 50 F.A.
8.00	spec. parkways	1,042,926	100 N.Y.
.82	spec. parkways	349,700	100 F.A.
.60	miscellaneous	99,100	100 F.A.

New York's 1940 plans should approximately follow the lines of the 1939 figures shown above.

North Carolina

Approximately $21,800,000 will be spent for highway purposes in North Carolina during 1940, with 78% of this total being derived from state gas tax and vehicle license fees, and 22% from Federal aid. This will allow the state a program equivalent to that carried on in 1939.

It is estimated that $9,300,000 of this total will be spent on construction as follows: 325 miles of grading, $2,700,000; 115 miles of topsoil, sand or gravel surfacing, $280,000; 70 miles of crushed stone, $430,000; 180 miles of oil treatment, $580,000; 80 miles of high type paving, $1,980,000; 65 miles of low type paving, $625,000; 110 miles of widening on high type paving, $725,000; and bridges and grade separations, $1,980,000.

No highway funds were diverted in 1939.

North Dakota

A total of $4,650,000 will be available for highway use in the state of North Dakota. The highway construction portion of this sum represents a 16% increase above the 1939 expenditure. North Dakota's 1940 funds will be allocated as follows:

Construction	$2,600,000
Maintenance	1,600,000
Other	450,000
Total	$4,650,000

Fifty per cent of the road construction costs will be covered by regular Federal Aid funds while grade crossing construction will be entirely financed by Federal funds.

State funds will be made up of $2,200,000 in gas taxes and $850,000 derived from vehicle license fees.

None of North Dakota's 1939 highway funds were diverted.

State officials report that figures on the allotment of funds for various grading and surfacing operations are not available at this time.

Ohio

About 4% is the increase in highway expenditures reported by Ohio for 1940 operations. Funds of $25,000,000 will be available, with $15,000,000 scheduled for construction and $10,000,000 assigned to maintenance.

Ohio's 1940 income is estimated as follows: regular Federal Aid and secondary projects $4,600,000; other Federal, including grading $1,200,000; state gas tax $16,600,000; and $2,600,000 derived from state vehicle license fees and other income.

Division of the construction fund will be made in approximately the following manner:

	Miles	Amount	Quantities Required
Grading and paving	280		6,500,000 cu. yds.
Bituminous improvement	110	$2,000,000	1,400,000 sq. yds.
Paving, high type	125	8,250,000	1,500,000
Paving, low type	45	1,000,000	500,000
Bridges and railroad crossings (100)		3,750,000	

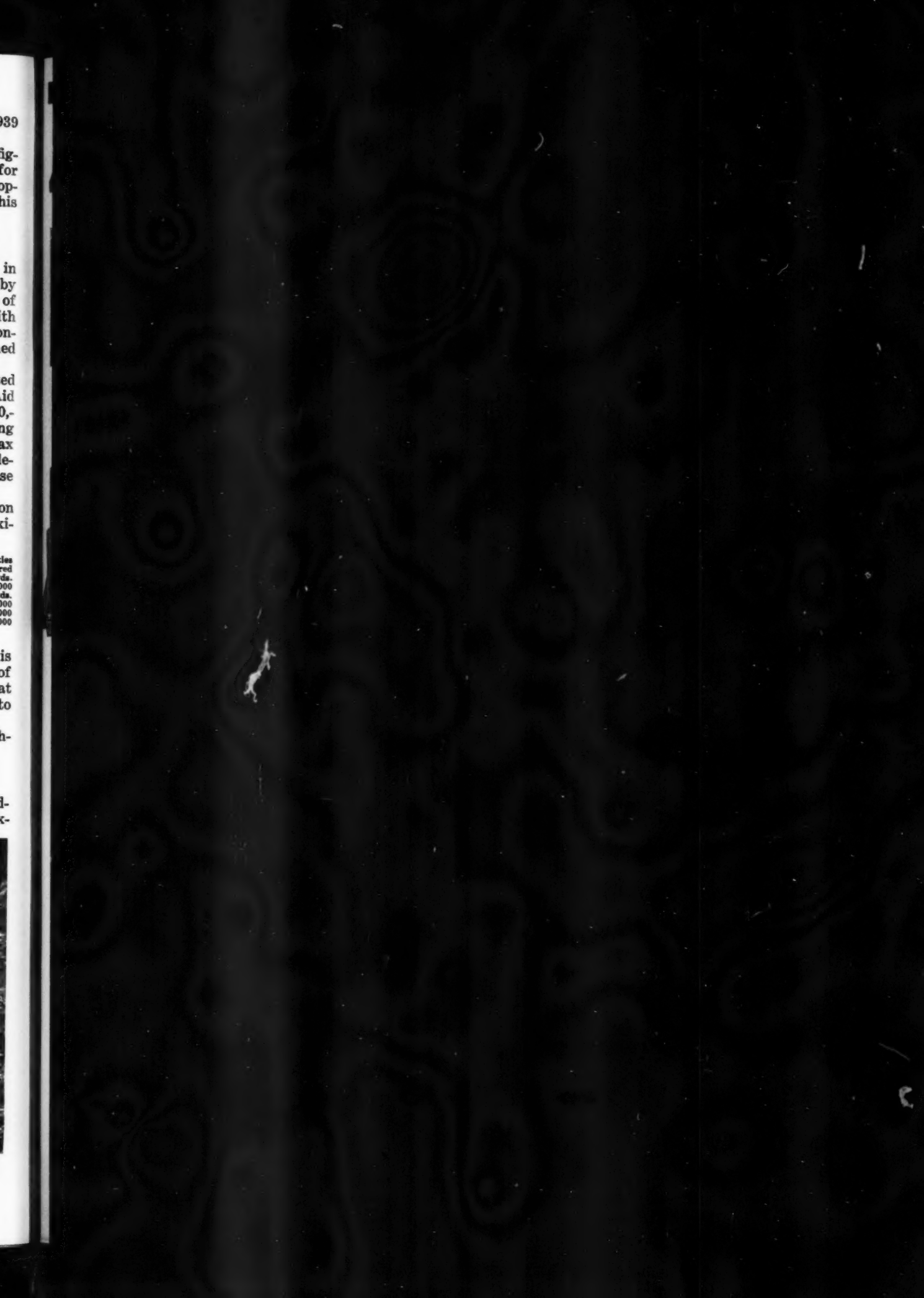
In addition to this work it is estimated that 2,000,000 yards of excavation awarded previously at $920,000 will be carried over into the 1940 program.

There was no diversion of highway funds in Ohio during 1939.

Oklahoma

The $16,400,000 highway budget of Oklahoma closely approx-

● Robert E. Tompkins' 2-yard Bucyrus-Erie tackles a tough side hill cut as it loads to a Euclid wagon on a state of New York road building job.



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It's the same "Caterpillar" Diesel Power which has been setting the industrial world agog with its efficiency and economy. . . . The same engines which are making records of thousands of hours of steady, dependable, low-repair operating of tractors, crushers, excavators, graders, compressors, and mill machinery of all kinds. Powering yard, shifting, pit-and-quarry locomotives is just as natural and practical with "Caterpillar" Diesel Engines — just as profitable for their owners. Take the case of the Wabash Cement Co., Osborn, Ohio:

Here two "Caterpillar" Diesel-powered locomotives haul 40-ton train-loads of rock from quarry to mill. Over a ¾-mile haul, each locomotive handles twelve train-loads per day. Each engine uses only about two gallons of 8c fuel per hour. In addition, maintenance costs are so relatively low and depreciation is so comparatively slow that no other type of hauling or equipment-driving power today can compare in economy with "Caterpillar" Diesel.

Because "Caterpillar" engineering and manufacturing are far past the experimental stage, these engines have design that involves neither frequent nor delicate adjustments; simplicity that requires no specially trained attendants; sturdiness and durability that enable them to take heavy punishment and assure long serviceable life. What's more, "Caterpillar" Diesel Engines are backed by the most complete and readily available replacement parts and service facilities of any engines in the world.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

Leading manufacturers of excavating, contracting and industrial equipment power their products with "Caterpillar" Diesel Engines. Why not specify "Caterpillar" Diesel Power in your next purchase? Why not, also, replace present ageing power with "Caterpillar" Diesel — *now?*

ENGINE SIZES — 32 to 160 horsepower (max. rating)
ELECTRIC SET SIZES — 13 to 90 kilowatts (cont. rating)

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DIESEL ENGINES AND ELECTRIC SETS

TRACK-TYPE TRACTORS • ROAD MACHINERY

imates the amount spent for road work during 1939. Construction, including administration, will total $12,920,000 and maintenance, also including administration, will require the balance of $3,480,000.

Federal funds will provide $3,120,000 of the budget, with $2,317,000 of that figure representing regular Federal aid. The state gas tax will furnish $11,000,000 and vehicle license fees and other sources an additional $2,280,000.

Estimated division of construction funds indicate the following program: 8.5 miles of grading amounting to $281,000; 137.4 miles of gravel, crushed stone or hard dirt, $2,844,558; 245.3 miles of high type paving (bituminous) costing $2,851,621; 40.3 miles of high type paving (concrete), $1,738,400; 0.9 miles of low type paving, $32,000; and bridges and grade separations totalling $1,588,000. This leaves $3,564,421 in funds which have not as yet been programmed. The above breakdown of construction work is the estimation of each of several projects. A paving project may include grading and bridges. Only those projects for grading alone, or bridges only, are set up in those classifications.

Oklahoma had no diversion of highway funds in 1939.

Oregon

The $15,000,000 available for 1940 highway purposes amounts to a 5 per cent increase in the Oregon budget over the 1939 allotments. Construction will total $6,000,000; maintenance $3,700,000; and bonds, surveys, right-of-way, etc. $5,300,000.

Regular Federal aid will account for $2,100,000 of the budget, other Federal sources, $1,450,000. The state gas tax will bring in $10,300,000 and vehicle license fees, after deducting $2,200,000 for counties and $350,000 for state police, will provide $1,150,000.

Tentative plans outline the following division of the $6,000,000 construction allotment: 140 miles of grading involving 4,000,000 yards of material, $2,000,000; 300 miles of gravel or crushed stone surfacing, involving 615,000 tons of material, $1,400,000; 350 miles of oil treatment involving 17,000 tons of material, $850,000; 25 miles of high type paving, involving 320,000 square yards of material, $800,000; 20 miles of low type paving involving 260,000 square yards of material, $150,000; 18 bridges totaling 2,500 lineal feet, $800,000. Carry-over amounts are included in the above break-down.

Oregon reports no diversion of highway funds in 1939.

Pennsylvania

According to the following report received from Clayton E.

Canada's Highway Outlook

By Grant Moloney, Editor, "The Canadian Engineer"

Approximately $1,420,000,000 has been spent during the past twenty years on Canadian roads, streets, grade separations and highway bridges, including all municipal expenditures, but not including money spent prior to 1919, and not including airport paving. Canada's highway system as it stands today represents an investment of at least $1,500,000,000.

In the United States the per capita expenditure on roads is more than three times as great as the Canadian figure—on both construction and maintenance. In Canada's railway-bridge field, thousands of structures will have to be rebuilt to carry the modern railway loadings. Many of these bridges are fifty, sixty and even eighty years old. Airport construction and runway paving will also be important for the immediate future.

The future of road work in Canada is affected by another condition, the war. Transportation is essential to modern life and industry—more so during war than in peace. Many roads will have heavier traffic than ever. Maintenance will be increased, some new road work will be found essential, or at least very desirable. New industries and new military camps will have to be served with highway connections. Many natural resources will have to be developed on a tremendous scale and at a speed previously unconsidered. There will be need for highway engineering, road materials and road machinery in all parts of Canada. Road work has had great stimulus since 1914. And it will leap ahead again in 1940.

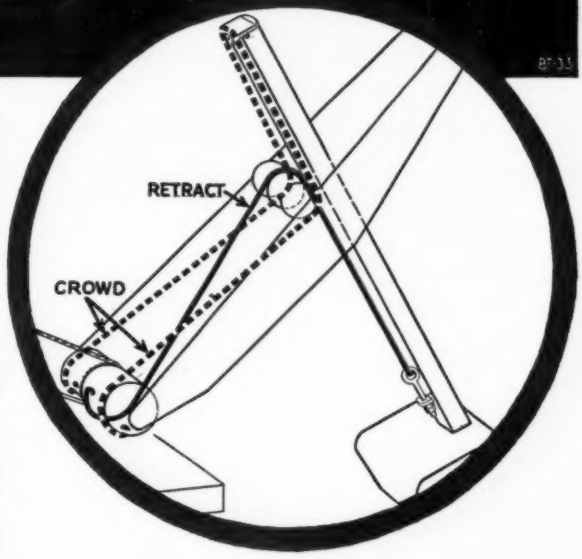
● **Clay County, Missouri, builds its roads in the modern manner with these two International TD-40 powered Bucyrus-Erie 2-Wheel scrapers working in heavy clay going.**

"We like the independent, twin rope crowd,"

Says

LAWRENCE CONTRACTING COMPANY

"Original twin crowd cable broke after approximately 60,000 yards and 750 hours," they continue. "Original retract cable has dug 95,000 yards and is still o.k." Both blasted rock and ordinary dirt were handled in that time. Average output in dirt has been 100 bank yards per hour. Best record in rock was 4,845 bank yards in 50 hours. In one month of 250 hours, the Lawrence machine loaded 20,016 yards of rock "which does not blast any too satisfactorily." A crowd has to be good to give performance like that. Positive and completely independent the 20-B crowd has twin ropes giving double strength where most engine power is applied. Full engine power can be used and there is plenty of crowd-power even with the loaded dipper thrust beyond the boom point. The single cable retract has 1½ times crowd-out speed, giving a digging action balanced for power, speed and complete control. Ask us for the full story on what this crowd means in output and low maintenance.



Twin crowd and single retract ropes are wound in opposite directions on a grooved drum which is rotated by a chain drive. This combination gives the most efficient, economical crowd possible. Their original crowd cable cost the Lawrence Contracting Co. $13.30, or .00022 cents per yard.

Bucyrus-Erie

SOUTH MILWAUKEE WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

● Highway construction job No. 1 for 1939 was Pennsylvania's 161-mile "all-weather" turnpike through the Allegheny Mountains. Here an Allis-Chalmers powered Baker 'dozer levels fill on the Connell and Laub contract near Somerset, Pennsylvania.

Ellis, Editor of Pennsylvania's "Highway Builder" this state looks forward to another big year, approaching the magnitude of 1939 in highway construction with completion work on the gigantic Pennsylvania Turnpike project coming up in the early months of 1940 and the anticipated regular state highway construction program for which estimates exceed those of 1939 by a great deal.

Pennsylvania's department of highways plans a $20,000,000 construction program for rural and primary routes during the winter months with approximately $2,000,000 allocated to rural roads in an effort to reduce the unimproved rural mileage throughout the state. A large percentage of the proposed program is also slated for use on the William Penn Highway, important trans-Commonwealth route, which is badly in need of reconstruction and improvement at the present time.

The complete highway program for 1940 is estimated to be between $26,000,000 and $35,000,000 with the Federal aid program, including secondary and grade-crossing elimination, getting under way at an early date. The program this year has been a little more than $7,000,000.

The Pennsylvania Turnpike, which has aroused national interest because of its ultramodern design as well as through the rapidity of its construction, has an average completion record of 65 per cent on the 57 contracts which are under way as of December 1. To that date, the total amount of all contracts awarded was over $41,000,000. Total cost will be $61,000,000; $26,000,000 in the form of a direct P.W.A. grant, the remainder in a loan of $35,000,000 from the R.F.C. which is to be retired by tolls in fifteen years.

No forecast of future highway trends in Pennsylvania could be complete without mention of the proposed extension of the Turnpike, from Harrisburg to Philadelphia, on the east, and from Pittsburgh to the Ohio state line on the west. President Roosevelt has already pledged his support of the plan as a military and economic necessity, and Governor James has expressed his approval, although enabling legislation passed by the General Assembly of Pennsylvania is needed before the construction of these important links may proceed under the present plan. However, it is believed that such legislation is possible within the next year.

Rhode Island

According to G. H. Henderson, Deputy Director and Chief Engineer for the Division of Roads and Bridges, Rhode Island will have $3,250,000 available for highway use during 1940.

This sum will provide $1,750,000 for construction; $1,200,000 for maintenance; and $300,000 to cover other costs. Regular Federal Aid will furnish one-half of the construction fund, while state funds will provide the balance. Maintenance and other costs will also be covered by state appropriations.

The $1,750,000 allocated for construction will provide $1,600,000 for high type paving and $150,000 for bridges. In addition to the program as planned, 165,000 yards of previously awarded excavation,

● Loading to Cummins Diesel-powered rear end dump trucks this Northwest shovel removes blasted rock while in the background drilling crews prepare the next "shot." The locale is Guthrie-Marsch-Peterson's Mount Joy contract on the Pennsylvania Turnpike.

FEDERAL AID GRADE CROSSING PROJECTS
AS OF OCTOBER 31, 1939

STATE	COMPLETED DURING CURRENT FISCAL YEAR					UNDER CONSTRUCTION					APPROVED FOR CONSTRUCTION					BALANCE OF FUNDS AVAILABLE FOR PROGRAMMED PROJECTS
	Estimated Total Cost	Federal Aid	NUMBER			Estimated Total Cost	Federal Aid	NUMBER			Estimated Total Cost	Federal Aid	NUMBER			
			Grade Crossings Eliminated by Separation or Relocation	Grade Crossing Structures Reconstructed	Grade Crossings Protected by Signals or Otherwise			Grade Crossings Eliminated by Separation or Relocation	Grade Crossing Structures Reconstructed	Grade Crossings Protected by Signals or Otherwise			Grade Crossings Eliminated by Separation or Relocation	Grade Crossing Structures Reconstructed	Grade Crossings Protected by Signals or Otherwise	
Alabama	$ 515,350	$ 503,059	5	1		$ 743,712	$ 742,184	11			$ 43,508	$ 43,300	1	1	2	$ 816,092
Arizona						518,061	515,813	6								209,120
Arkansas	189,891	189,891	3			669,853	663,348	3			23,968	23,968	2		8	593,191
California	605,661	605,611	5			1,137,816	1,136,771	6		1	137,560	137,560	2		1	1,243,433
Colorado	309,307	309,305	3		11	306,992	306,992	2			48,514	44,754			14	791,132
Connecticut						172,722	161,008		1		21,333	21,333			7	829,223
Delaware						9,150	9,150	2			2,320	2,320			1	513,891
Florida						624,747	620,249	4			11,800	11,800			3	1,034,542
Georgia	56,530	56,530	3			405,396	405,396	4	1		446,616	446,616	6	3	21	1,957,478
Idaho	191,612	160,443	3			122,880	122,518	1								466,886
Illinois	1,846,535	1,845,675	11	3	43	1,828,339	1,689,967	10	1	21	184,242	173,570	3		24	1,979,000
Indiana	739,703	739,703	3	1	45	398,555	398,555	1	1	33	423,614	423,614	1	1	52	740,558
Iowa	340,647	321,200	10		2	279,344	242,456	4		40	755,748	707,700	1		180	831,318
Kansas	697,393	697,393	8		4	655,704	655,704	7		1	354,569	351,643	5		7	778,718
Kentucky	380,015	380,015	6	4		396,061	396,061	6			771,423	771,423	5		13	375,135
Louisiana	122,838	122,830	2			824,494	770,989	7			317,665	317,659	10			584,469
Maine	327,109	327,109	3	2		208,728	208,728	2	1							236,310
Maryland	24,510	15,402				240,795	240,795	2		2	46,200	46,200			13	925,099
Massachusetts	265,259	264,538	1	2		257,307	256,764	3			14,320	14,320	1			1,711,447
Michigan	386,326	386,326	3	2	7	855,015	855,015	5		3	475,081	475,081	3		29	1,309,120
Minnesota	254,481	251,067	1	4	6	1,237,359	1,217,528	9	2	7	509,223	336,263	3		6	1,117,339
Mississippi						611,373	611,373	8			37,300	37,300	1			889,528
Missouri	65,589	64,284	1			1,266,356	1,266,356	7	2		680,534	655,256	3	4		1,324,064
Montana	614,653	614,653	6			448,927	333,846	6			80,000	80,000	1			204,589
Nebraska	381,275	380,675	13			781,157	781,157	12	1	2	269,075	269,075		1	45	511,406
Nevada	156,993	156,993		1	3	37,305	37,305		1	5	11,577	11,577			5	114,944
New Hampshire	48,623	48,202	5		1	113,962	113,879	3			45,804	45,804	2			313,600
New Jersey	7,140	7,140			1	730,316	730,316	2	3		150,090	150,090	1			1,289,255
New Mexico	59,805	59,805	2			15,276	15,276				2,572	2,572			1	692,665
New York	1,172,330	1,168,630	2	5		2,360,212	2,182,492	10	9		200,820	200,120	1	1		3,453,396
North Carolina	668,844	636,144	4	2	18	876,400	874,000	9	3	8	444,735	444,735	2	1	39	586,364
North Dakota	105,450	105,450	3	1		818,483	770,087	9			75,960	75,960	1			391,201
Ohio	308,640	293,640	6			1,449,673	1,378,721	8	3		917,090	917,090	6		4	2,473,570
Oklahoma	266,955	266,955	3		32	187,025	187,025	3		11	307,500	294,700	8	1	8	1,924,197
Oregon	40,500	39,002				266,498	265,204	3								311,060
Pennsylvania						2,344,004	2,132,105	6	4		520,652	312,200	2		2	4,218,923
Rhode Island	327,613	327,613	1	2		111,178	111,178		1							152,459
South Carolina	177,614	144,232	4	2	7	590,456	568,120	6	3		179,375	179,375		2	26	782,723
South Dakota	72,757	72,757		1	8	336,475	336,475	4	2	9	47,550	47,550	1			995,433
Tennessee	73,600	73,600		1	1	799,806	799,806	3	3	2	6,760	6,760			2	1,332,344
Texas	1,204,696	1,173,640	12	2		2,321,258	2,256,842	18	1		51,150	51,150			26	1,913,207
Utah	111,841	111,778	2		32	146,758	146,758	1		53	161,010	161,010			58	177,522
Vermont	35,058	30,246			7	1,462	1,462				118,940	118,940		1		200,249
Virginia	207,404	207,404	2		16	515,975	423,075	7	2		129,256	129,256	1	1	4	909,331
Washington	126,622	126,621	1		8	209,590	208,180	2	1	2	208,720	208,037	1	2	2	362,668
West Virginia	64,417	64,417	2			310,434	294,674	5			24,200	24,200	1		3	959,985
Wisconsin	480,877	478,594	6		2	1,056,194	1,012,263	9	1	6	684,738	625,617	3	2	6	650,823
Wyoming	40,626	40,470	1		7	98,543	98,543		1							516,862
District of Columbia						292,412	258,868	1			74,400	74,400				+7,053
Hawaii	52,950	50,320	1			132,850	132,850	3	1		6,216	6,216			1	353,234
Puerto Rico	49,040	48,840	1			345,312	343,310	8								426,676
TOTALS	14,175,079	13,968,202	148	36	261	31,468,706	30,287,537	248	49	206	10,023,728	9,478,114	78	21	613	47,522,832

● Construction of U. S. 76 between Columbia and Sumter, South Carolina called for the operation of a 500,000 yard borrow pit. Here an Adams elevating grader loads to a Euclid wagon for the John E. Ballenger Construction Company of Lakeland, Florida.

amounting to $70,000, will be carried over into 1940.

South Carolina

Because pending legislation indicated a serious threat of diversion of gasoline tax funds, South Carolina got off to a slow start with 1939 contracts. When the legislature adjourned in June without seriously side-tracking funds, highway contracts totalling $3,000,000 were let.

A large part of this work will be carried over into 1940 and new contracts will be let as funds become available. The present outlook is that the Highway Department will finance between $6,000,000 and $7,000,000 in highway work. This will include about 300 miles of new bituminous surface, concrete and bituminous widening work, bridges and grade separations, and about 10 miles of concrete pavement on dual lane roads.

During the 1939 calendar year construction totalled $8,000,000, a large part of which was let in 1938. Six major projects were carried out, including 3 inter-state bridges. Substantial progress was made on the dual lane highway between Spartanburg and Greenville and about 300 miles of new roads constructed.

Expenditures for maintenance purposes during the fiscal year ending June 30, 1939, were: direct maintenance, $1,452,247; supervision, $57,059; retreatments, $595,128; shoulder treatment, $458,652; special maintenance work, $20,007; and the purchase of new equipment, $380,027.

South Dakota

The estimated 1940 highway fund for South Dakota is $7,275,000 which is approximately 20% above the 1939 figure, according to Thor Soleglad, Assistant Highway Engineer. This sum is to be spent in the following manner:

Borrowed funds	$ 300,000
Construction (awarded 1939)	1,160,000
Construction (for 1940)	3,465,000
Maintenance	2,000,000
Other (overhead, etc.)	350,000
Total	$7,275,000

Sources from which these funds will be obtained are the following: regular Federal Aid $2,000,000; other Federal $750,000; state gas tax $3,700,000; and state vehicle license fees and other income $825,000.

South Dakota's 1940 construction funds are scheduled for expenditure in the following manner:

	Miles	Amount	Quantities Required (Yards)
Grading	210	$945,000	7,500,000
Surfacing—			(Tons)
Base courses	180	720,000	810,000
Oil treatment	185	955,000	
Paving, high type	19	495,000	
Bridges (30)		350,000	

Carry-over work previously awarded consist of 4,000,000 yards of excavation costing $400,000. No diversion of highway funds was made in South Dakota during 1939.

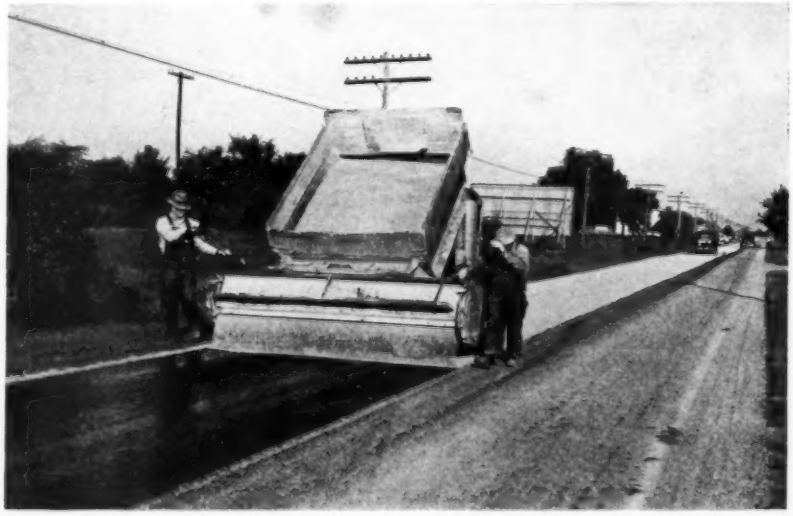
Tennessee

According to government reports (as of October 31, 1939) 42.7 miles of Federal Aid highway were completed at an estimated cost of $2,390,148 during the current fiscal year. Of this amount, $1,126,512 was provided by Federal funds.

Tennessee at present has 86.4 miles of Federal Aid highway under construction which will probably run to $3,500,068; $1,750,034 to be derived from Federal funds. At present there is $3,425,551 available for programmed Federal projects.

Recently completed are about 27.1 miles of secondary or feeder

● Modern road maintenance operations near Findlay, Ohio, call for the use of a Buckeye surface material spreader.



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METHODS AND MATERIALS
FOR THE
HIGHWAYS OF TOMORROW
ROAD SHOW
CHICAGO
JAN. 29 - FEB. 2
1940

● **The Andrews Asphalt Paving Company of Hamilton, Ohio, employs a Buffalo-Springfield trench roller (foreground) and a 10-ton Buffalo-Springfield tandem on U. S. 42 widening and asphalt paving operations between Cedarville and Xenia, Ohio.**

roads at a cost of $732,508. State funds financed $418,554 of this work. Current construction amounts to approximately $226,796 on 5.3 miles of Federal Aid secondary roads.

A $799,806 grade crossing program, entirely financed by Federal Aid, is also underway.

Texas

Texas closed its books for another fiscal year on August 31, 1939, completing one of the largest years in the history of the state's highway department. In 1924 when maintenance of state highways was first assumed by the state, there were approximately 18,000 miles with only 4,000 miles hard surfaced. On August 31, 1939, there were:

	Miles
Unimproved	1,930
Graded and drained	1,739
Gravel, caliche, etc. surface	2,046
Asphalt surface	11,345
Concrete and brick	5,215
Total	22,275

Expenditures for Texas' 1939 operations were derived from the following sources:

State and Federal funds on hand	$ 9,536,065
State license fees	7,891,973
State gas tax	21,708,416
Other state income	209,065
Federal aid	13,599,584
Total	$52,945,103

Texas' 1939 highway construction and maintenance expenses ran to $48,211,350 leaving a balance on August 31, 1939 of $4,733,753. Latest reports list the sum of $24,638,000 available in state and Federal highway funds not under contract.

Utah

W. L. Anderson, State Highway Design Engineer, reports $5,520,000 available for Utah's 1940 road program. Of this amount $3,800,000 has been scheduled for highway construction, $1,500,000 for road maintenance, and $220,000 for other work.

This outlay represents a 5% increase over Utah's 1939 funds. Present construction funds are expected to be divided in the following manner:

	Miles	Amount	Quantities Required
Grading	12	$ 275,000	2,750,000 (Yards)
Surfacing (gravel or crushed stone)	36	775,000	1,500,000 (Tons)
Oil Treatment (mat and surface)	17	150,000	
Paving (high type)	22	930,000	
Paving (mixed bituminous)	105	1,125,000	
Bridges (number)	12	545,000	

This active road program will be financed by the following: regular Federal Aid funds of $1,700,000, including Federal secondary roads and grade crossing projects, Federal land amounting to $220,000, state gas tax revenue of $3,500,000, and $900,000 from state vehicle license fees and other sources. Of this last amount $800,000 is allocated to Utah's counties and cities for road expenditures.

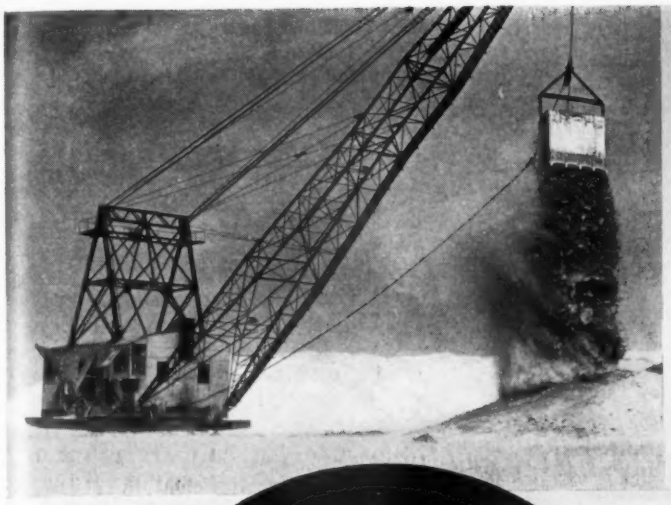
In addition to the work outlined above, 1,136,300 yards of highway excavation previously contracted for at a price of $178,088 will be carried over into Utah's 1940 program. No highway funds were diverted during 1939.

Vermont

Vermont's department of highways reports approximately $2,890,125 available for 1940 road building activities. Of this amount $1,790,125 is slated for highway construction while the remaining $1,100,000 has been allocated to maintenance of the state road system.

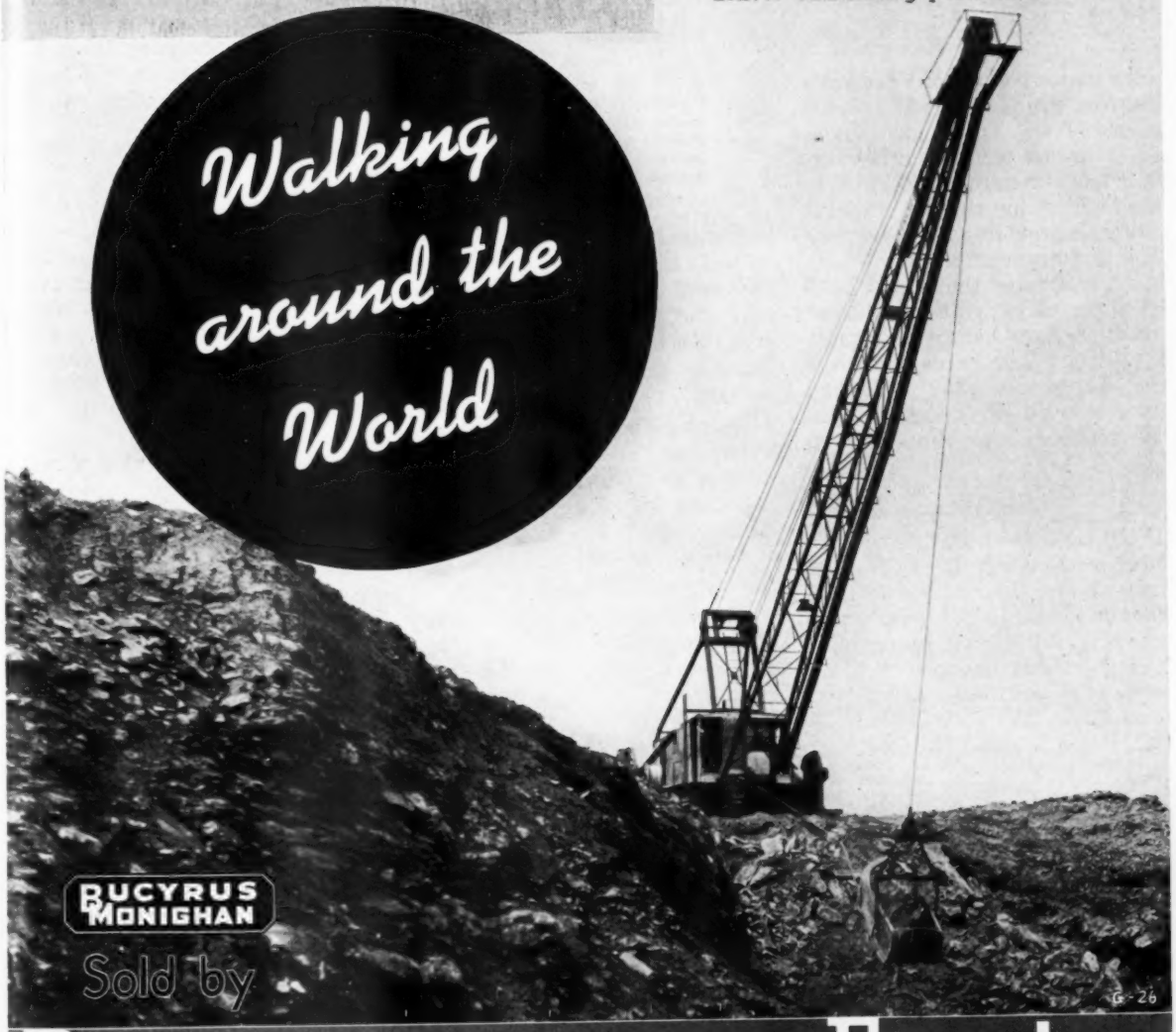
No breakdown is available at this time regarding the allotment of these funds for grading, surfacing, and bridge building activities.

● **A Griffin Wellpoint pump "dewaters" the site of a bridge abutment on New York's Circumferential Highway near Manhattan for a Northwest clamshell. Poirier and McLane, Inc., of New York City, held the $528,928 contract.**



Digging canals; building levees and dams; stripping gold, tin and coal — these are only a few of the jobs Bucyrus-Monighan walking draglines have handled all over the world. For 27 years these machines have been "walking their way to success" on soft footing and over rough ground. Leading dirt-movers today choose Bucyrus-Monighans for the long-range big-output jobs because these machines have thoroughly proven their ability to deliver outstanding performance.

Walking around the World



Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

● Fill for the east approach of Washington's large suspension bridge across Tacoma Narrows is loaded out of a borrow pit to double-spotted GMC trucks by a 1-yard Bucyrus-Erie.

The major portion of Vermont's 1940 road funds will be $2,110,000 derived from state gas taxes, vehicle license fees, and other revenue. The remaining $780,125 is to be provided by regular Federal Aid funds providing for secondary roads and grade crossings.

It is estimated that about 550,000 yards of excavation awarded during 1939, or before, at a price of $175,000 will be carried over into Vermont's 1940 program. There was no diversion of highway funds in this state during 1939.

Virginia

Virginia's 1940 highway funds show a decrease of $1,236,791 under the total spent in 1939. Allocation of the 1940 funds, which total $26,731,817, will be made in the following manner:

Construction (primary system)	$11,077,248.13
Maintenance (primary system)	3,000,000.00
Maintenance (secondary system)	3,750,000.00
Improvements (primary system)	2,000,000.00
Improvements (secondary system)	3,912,600.00
City Streets	500,000.00
Other	2,491,968.87
Total	$26,731,817.00

State highway funds will be available from the following sources: state gas taxes $17,400,000, state vehicle license fees $6,870,200, and regular Federal Aid $2,461,617.

Information on the allotment of Virginia's 1940 construction funds was not available this early. Virginia reports no diversion of funds for 1939.

Washington

Preliminary statistics prepared by L. V. Murrow, Director of Highways, forecast a program totalling $15,945,000 for 1940 highway work in the State of Washington. This includes funds carried over from 1939 contracts and is an increase of 7% over last year's budget.

Regular Federal aid will supply $3,059,000 and other Federal sources an additional $2,829,000. The state gas tax and motor vehicle funds will make up the balance of $10,057,000. These figures include carry-over funds from 1939.

Plans as outlined at present indicate that $10,785,000 of the total will be used for construction work, $3,830,000 for maintenance, and $1,330,000 for other costs. The construction allocation will be divided as follows:

	Per Cent
Grading and surfacing	51
Cement concrete pavement	10
Bituminous surfaces	8
Miscellaneous	1
Bridges	21
Grade separations	9

West Virginia

Construction funds totaling $7,730,518 have been reported available for West Virginia's 1940 road building activities by E. N. Blackwood, State Construction Engineer. This sum is about the same as was used in carrying out the state's 1939 highway program.

Money for financing West Virginia's 1940 program will be received from the following sources:

Federal Funds—	
Regular Federal Aid	$2,362,314
Other	781,500
State Funds—	
Bond sales	1,996,704
State gas tax	4,000,000
Total	$9,140,518

Figures on the division of 1940 construction funds were not available at press time. It is estimated that 1,180,000 yards of grading and drainage excavation awarded previously at a price of $932,482 will be carried over into the 1940 program.

There was no diversion of high-

● Today's highways call for high speed cement placing and finishing operations. This Jaeger finisher working with a Koehring 27-E paver laid 3,540 feet of 20-foot concrete paving in one fourteen hour day on a road job in Rusk County, Wisconsin. Koepke Construction Company of Appleton, Wisconsin, held the contract.

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● This Bucyrus-Erie loads to bottom-dump Euclid wagons on highway construction operations near Martinsville, Indiana. Contract on this job was held by the Calumet Paving Company of Indianapolis.

way funds in West Virginia during 1939.

Wisconsin

Wisconsin State Highway Officials were unable to release their 1940 road plans before Excavating Engineer's editorial deadline. However, figures on their 1939 activities were available and will give some idea of Wisconsin's present position.

During 1939 a decrease of 25% in highway funds under the previous year gave Wisconsin a total of $12,275,000 to be used on highways during the past year. Of this amount 75% was obtained from state funds derived from state gas tax and vehicle license fees, the remaining 25% was provided by the Federal Aid program.

Wisconsin's state road construction program received $7,775,000 of the total highway funds while $4,500,000 was spent in the maintenance of the existing state roadways.

Grading operations on 102 miles of highway called for $1,446,000 of the total construction fund. The balance of construction expenditures consisted of the following surfacing operations:

170 miles of gravel or crushed stone surface	$ 810,000
398 miles of oil treatment	335,000
142 miles of high type paving	3,251,000
Miscellaneous work	268,000

An expenditure of $1,565,000 for bridge construction completed Wisconsin's 1939 highway construction activities. There was no diversion of highway funds in Wisconsin during 1939.

Most of the highway excavation contracts awarded in 1939 were cleaned up in that year and very little work was carried over into 1940.

Wyoming

During the past year, Wyoming completed a $3,700,000 construction program, involving 130 miles of grading and approximately 400 miles of oiling of various types. At the present time, there are approximately 3,900 miles in the state highway system, all of which, with the exception of about 400 miles, are oiled. During 1939 the oiled mileage was increased by 370 miles.

The total mileage of Wyoming's highways has been increased by about 97 miles. Practically all of this increase is due to Wyoming's highway department taking into her system secondary or feeder roads which are being completed or have been completed to an oiled standard by the department.

Frank Kelso, state highway superintendent, reports that Wyoming has $4,600,000 for her 1940 road program. These funds have been allocated in the following manner:

Construction	$3,700,000
Maintenance	750,000
Other	150,000
Total	$4,600,000

These expenditures will be covered by $2,000,000 in regular Federal Aid funds, $1,800,000 derived from state gas taxes, and $800,000 from state vehicle license fees.

Grading operations will cover 130 miles of state roads and oil surface treatment will be applied to 400 miles of highway. In addition to these operations $1,800,000 of uncompleted work is being carried over into the 1940 program.

Wyoming's highway funds experienced no diversion in 1939.

● A Caterpillar-mounted LeTourneau Angle dozer, working for De-Remer-Atchinson of Omaha, Nebraska, on a highway relocation job near Buena Vista, Colorado, tackles some soft-going as it backfills a ditch.

Shots from the FIRING LINE

"Digging In" at Friant Dam

With work started on a construction camp and contractor's storage facilities at the Friant Dam site, heavy equipment has been moved in to begin excavation operations on the south abutment.

The first major task on this feature of the Central Valley Project, according to R. B. Williams, construction engineer for the United States Bureau of Reclamation, will be to remove about 770,000 cubic yards of earth and rock from both abutments and the base of the dam site to provide a firm foundation for the big concrete structure.

H. Stanley Bent, project manager for the contracting firm—Griffith Company and Bent Company—has reported that the entire excavation is expected to be handled by power shovels and dump trucks, with the aid of such equipment as pneumatic drills, jackhammers and bulldozers.

Mr. Bent announced the contractor's camp will be located on the Fresno County side of the San Joaquin River between the south abutment of the dam site and the new Government camp which already is completed and occupied by Bureau of Reclamation forces at Friant. He said it will be several months before many workers are employed. Ample labor is available at Friant for preliminary operations.

Following the initial ceremonial dynamite blast witnessed by 50,000 people at ground breaking exercises at Friant on November 5, the first work by the contractor has been grading for construction roads and storage facilities. A 70,000-volt transmission line is being built by power company crews, extending from Coppermine substation eight miles away to a new Friant Dam substation going up near the south abutment.

Besides the camp construction and excavation at the dam site, early operations will include stripping 600,000 cubic yards of overburden from the gravel deposit located along the south bank of the San Joaquin River 2½ miles below Friant.

A processing plant will be erected at the deposit to wash and screen more than 3,200,000 tons of aggregate which will be transported to the dam site over a 2½-mile railroad soon to be built by Griffith and Bent. The railroad will have a switching yard and a connection with the branch line of the Southern Pacific at Friant.

The trestle system of concrete placement will be employed at Friant Dam, in contrast to the tower and cableway system being erected at Shasta Dam, other major structure of the Central Valley Project. The trestle method is being used at Grand Coulee Dam on the Columbia Basin Project.

The Friant trestle will be built straight across the broad canyon at the dam site to carry traveling cranes, of the hammerhead and whirley type, which will handle concrete buckets transported out on the trestle by diesel-electric trains. The concrete mixing plant will be located near the top of the south abutment. The structural steel trestle will be buried in the concrete as the dam rises to its ultimate height of 300 feet.

Friant Dam is scheduled to be completed early in 1943, about a year ahead of Shasta Dam. The two great river regulation structures will serve multiple purposes of conservation and reclamation in the Sacramento and San Joaquin valleys.

Steel Pipe to Cool Shasta Dam Concrete

Over a million feet of steel pipe or tubing has been ordered by Government authorities for use in artificially cooling the concrete for Shasta Dam and other structures on California's Central Valley Project.

The National Electric Products Corporation of Pittsburgh, Pennsylvania, was awarded the contract for furnishing the pipe on its bid of $77,070, which was the lower of two bids received and opened by the Bureau of Reclamation.

The contract calls for 1,400,000 feet of black steel pipe or tubing of one-inch diameter and 15,000 feet of 90-degree and 180-degree bends. The tubing will be supplied in minimum lengths of 20 feet and the bends in lengths of 9 feet 8 inches and 5 feet 4 inches.

The ingenious system of artificially cooling concrete by circulating cold river water through metal tubing embedded in structures was developed by the Bureau of Reclamation and has been used in the construction of such large dams as Boulder and Grand Coulee.

Shasta Dam, for which this pipe was ordered, will be second in height to Boulder, the highest dam in the world, and second in size to Grand Coulee Dam, the most massive man-made concrete structure.

● **Two drill jumbos work full face under the steel roof support in the Manhattan end of the Queens-Midtown tunnel.**

Queens-Midtown Tunneling Operations

The final blast of the last ten feet of rock which holed through the two ends of the Queens-Midtown tunnel marked the completion of probably the most difficult of all of Manhattan's many tunnels. In spite of the obstacles encountered in forging this latest link in the island's chain of underwater arteries, traffic engineers say that the tunnel is well worth the $58,000,000 spent toward solving the city's traffic snarl.

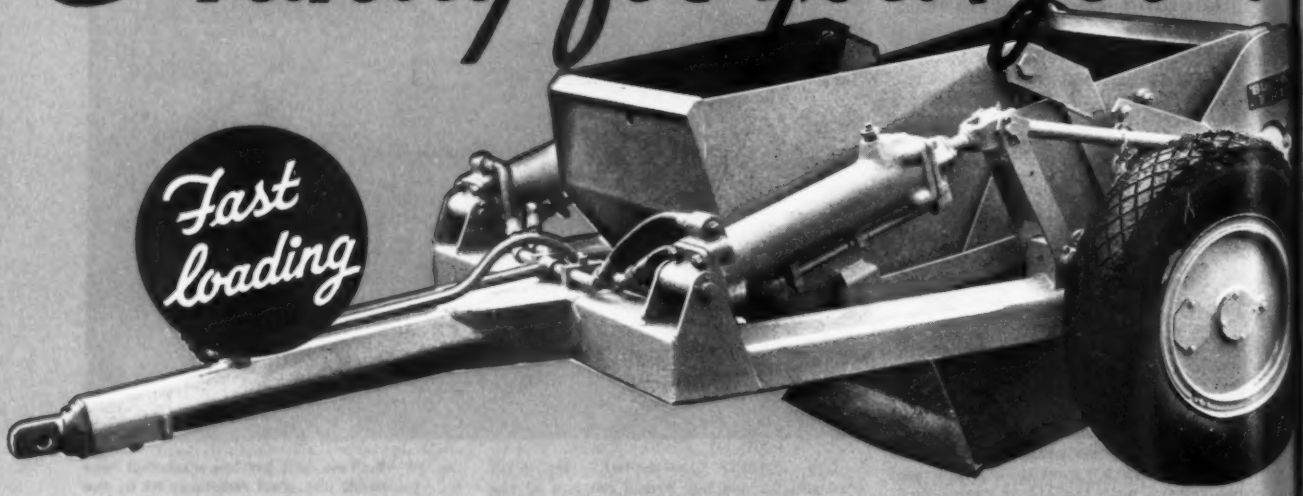
In 1925, 53,000,000 vehicles crossed the four bridges then spanning the East River; by 1937 this traffic had increased to 98,400,000 and engineers estimate that by 1940 the total will have reached 120,000,000.

The Queens-Midtown Vehicular Tunnel becomes almost a necessity in untangling the traffic congestion of New York's midtown section and freeing the clogged Queensborough Bridge at 59th Street, the most heavily traveled bridge in the world.

Construction of the new tunnel presented many difficulties from which the contractors on the Holland and Lincoln tunnels were free. The East River bed at the point chosen for the Midtown tunnel is an underlying wavy stratum of rock. As a result, the tunneling proceeded for much of the way in mixed earth and rock, which is more difficult and tedious than in full face rock or in the silt of the Hudson River.

In spite of these difficulties, the Walsh Construction Company has carried

Handy for your job.



2½ yards struc

Dumpi

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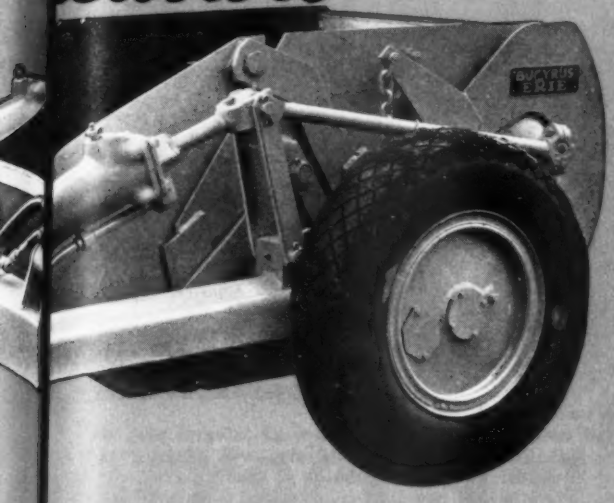
Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSI

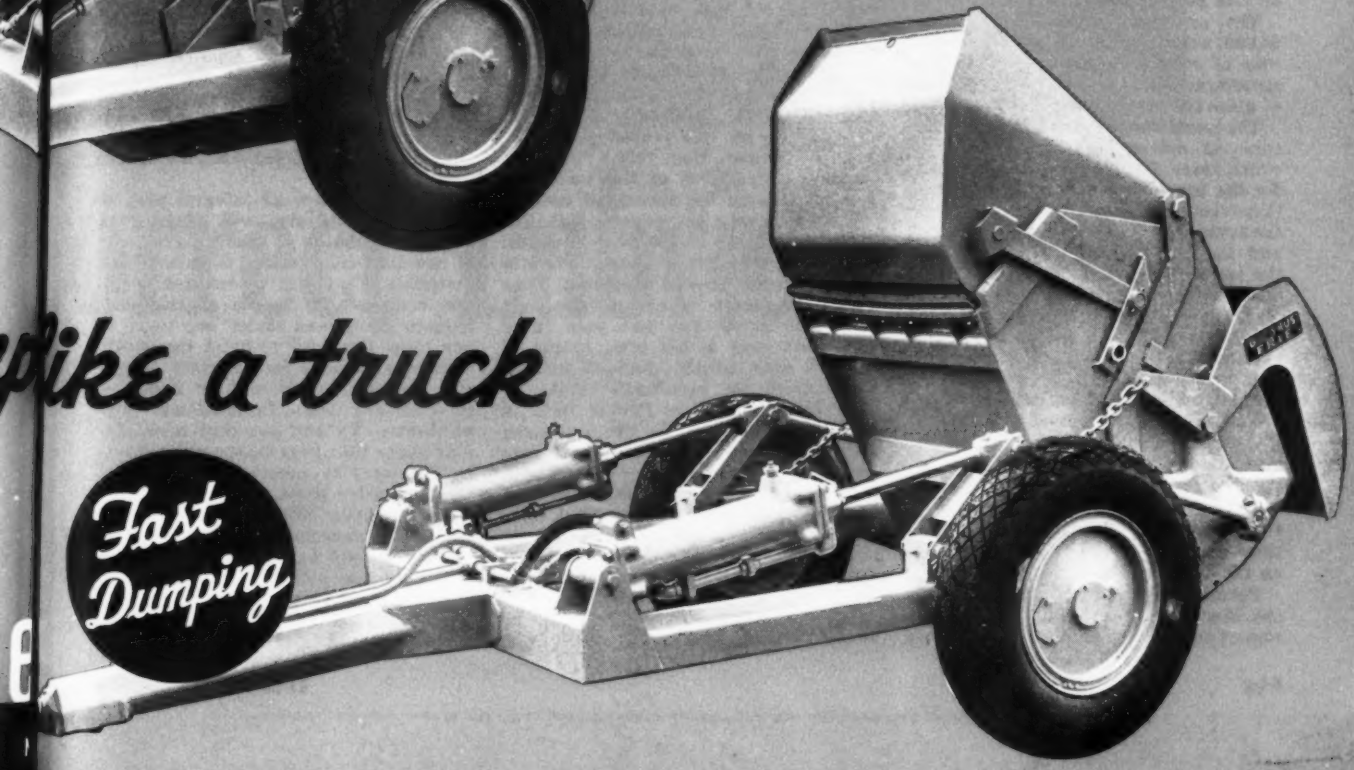
NEW H·28
Bucyrus·Erie Scraper

You'll like the new H-28 Bucyrus-Erie Scraper because this handy two-wheeler fits so many of your dirt moving problems as a complete one-man unit. It teams with an International T-35 TracTracTor or any track type or rubber-tired tractor of similar drawbar pull. It carries a struck load of 2½ cubic yards. The hydraulic control gives the same smooth accurate handling of bowl and blade, the same smooth grading and controlled dumping you get with the larger Bucyrus-Erie 2-Wheel scrapers. It dumps to the rear like a dump truck so that you can put dirt over end-dumps. This is the kind of dump you need for filling against foundation walls, bridge piers, or culverts; also for loading from a ramp to trucks or cars as in mining operations. Loading is quick and easy with the famous Bucyrus-Erie double curve cutting edge that boils the dirt up into the Scraper freely, easily, and without dead action. Buy this handy unit for your odd-job dirt moving. See your International Trac-TracTor dealer for the complete story.

easure



like a truck



Fast Dumping

P51

● Cajalco Reservoir becomes a man-made lake as it receives the first flow of the Colorado River Aqueduct. Note the outlet tower at the right.

through the tunnel with no deaths from the "bends" nor permanent disability due to compressed air.

Statistics of the tunnel, really two tunnels, one for eastbound and one for westbound traffic, are impressive. The estimated cost of $58,365,000 is being met by a P.W.A. loan of $47,130,000 and a grant of $11,235,000. Maximum annual carrying capacity is 16,000,000 vehicles.

In the construction, 53,000 cubic yards of earth, 100,000 cubic yards of rock and 93,000 cubic yards of mixed earth and rock have been taken out. Driving the two tunnels consumed approximately 400,000 pounds of 40% and 60% special gelatin dynamite. Of this, 267,000 pounds were used for the 100,000 yards of rock, so that the average obtained for the whole job was 2.67 pounds of explosive per cubic yard of rock. The 93,000 yards of mixed earth and rock consumed 133,000 pounds of explosive or 1.43 pounds per cubic yard.

The completed tunnel will require 64,000 cubic yards of concrete, 1,300 tons of reinforcing bars, 1,400 tons of structural steel and 175,000 square feet of glass tile for the ceiling of the tunnel.

The two principal obstacles to be overcome in driving the tunnel, both of which were foreseen by the engineers for the tunnel authority and the Walsh Construction Company, were: driving the tunnel through mixed earth and rock and the lack of sufficient cover above the tunnel just off shore on both sides of the river.

In order to prevent too steep a grade in the tunnel, the plans of the tunnel authority provided that it should run at a level which would bring the tubes above the bottom of the river bed at two points along its length. A protective blanket of 250,000 yards of clay had to be spread for approximately 500 yards on the Manhattan side.

This clay was picked up and used twice more on the Manhattan side and then picked up again and used twice on the Queens side.

Permission had to be obtained from the War Department for this obstruction of the channel, and the channel had to be restored to its original depth when the work was completed.

At one point on the Manhattan side, 20,000 cubic yards of clay were left over the tunnel as a permanent blanket, and 10,000 cubic yards of rip rap added to weigh it down.

The contractor, the Walsh Construction Company of Davenport, Iowa, is headed by Thomas J. Walsh, president, Ed P. Walsh, vice-president, David Small, vice-president, William A. Durkin, vice-president, J. H. Gill, vice-president, and John S. Macdonald, chief engineer. Ole Singstad is chief engineer for the New York City Tunnel Authority.

Colorado River Aqueduct Opened

Heralded as "a dream of empire come true" by officials of 13 states, the main line of the giant Metropolitan Water District Aqueduct was placed in operation November 19, 1939, pouring 270,000 gallons of Colorado River water per minute into the Cajalco Reservoir near Riverside, California. (For complete article on this project see Excavating Engineer, May, 1939.)

Regular operation of the main line aqueduct marks the successful completion of a gigantic engineering feat. The flood surging out of the western portal of the Valverde Tunnel onto the Southern California coastal plain had come across the desert, taken four mountain ranges in stride and had been lifted 1,617 feet over a 242 mile course of tunnels, open canals, conduits and siphons from the aqueduct's intake on Lake Havasu, back of Parker Dam on the Colorado River. To lift the water 1,617 feet, five pumping plants were used, each operating three pumps with individual capacities of 90,000 gallons of water per minute. This is only a third of the ultimate capacity of the aqueduct.

Cajalco Reservoir, the major water storage reservoir on the 392 mile aqueduct system, is a man-made lake which will eventually be four miles long and two miles wide, rating as one of the major lakes in Southern California. Situated about 10 miles south of Riverside in a natural basin in the hills, the reservoir has a capacity of 100,000 acre-feet of water, or about 33,000,000,000 gallons. It was created by the construction of an earth fill dam 195 feet high and a third of a mile thick at the base, and an earthfill dike 1½ miles long and 90 feet high, both paved on the reservoir side with reinforced concrete.

While the reservoir is filling up, which officials of the Metropolitan Water District say will be a matter of several months, the 150 mile distribution system will be completed. Water service will then be ready for the 13 cities of the district—Los Angeles, Anaheim, Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Pasadena, San Marino, Santa Ana, Santa Monica and Torrance.

Construction of the aqueduct was begun in 1932. It was built from the proceeds of a $220,000,000 bond issue voted by residents of the district in 1931, and ranks as the largest single water supply system in the United States. Ultimately, it will have a capacity of 1,000,000,000 gallons of water a day, providing sufficient water for several million additional residents in the area it serves in Southern California.

Will You Be There?

Road builders of 1940 and thereafter will remember January 29-February 2 as dates that mark the renaissance of road building according to a recent ARBA announcement. During those five days, 40,000 road administrators, planners and builders will gather in Chicago to co-ordinate plans for tomorrow's roads. The 1940 Road Show-Convention of the American Road Builders' Association will attract delegates from all of the United States and 36 foreign nations. This vast gathering of road-building representatives from all the world augurs an unparalleled American highway program.

The Road Show, an integral part of the annual conclave, will afford road builders a preview of nearly eight acres of new road-construction machinery and materials. They will be enabled to see and compare the merits of the most modern equipment under one roof, at one time. Designed to build the superhighways planned for an early tomorrow, this equipment will be displayed in Chicago's huge International Amphitheatre. Twenty per cent more display space than ever before utilized will be necessary to present this vast and comprehensive show.

High-ranking officials of the War Department, interested in roads for national defense, will be on hand in the mid-Western metropolis to exchange viewpoints with American road men. Plans for roads of a military nature closely parallel the plans for a system of inter-

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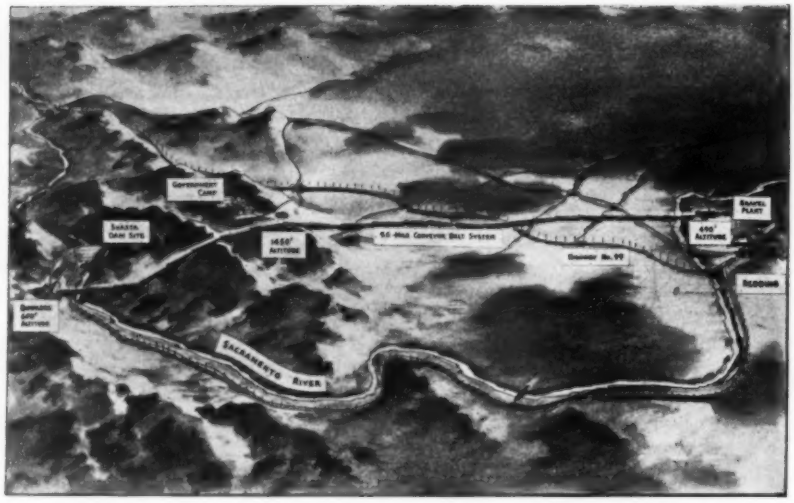

● An artist's sketch of the world's longest conveyor belt system which will carry aggregate from Redding, California to Shasta dam, a distance of 9.6 miles.

regional highways as recommended by the Public Roads Administration. The War Department, according to authoritative observers, will promulgate a network of military highways that will also adequately serve peacetime pursuits.

The ARBA Road Show and Convention will attract South and Central American delegates in unprecedented numbers. Great Britain and Germany, in peacetime, were the greatest competitors of the United States in the export of road-building equipment to the countries of South America. Occupied with destruction rather than construction, the larger manufacturing centers of Europe have been eliminated as competitors of the United States. South America is ever becoming more highway-conscious. Commercial and social penetration of their rich but undeveloped hinterlands is dependent upon roads. Areas adjacent to metropolitan centers, even as in the United States, are tortured with a traffic-congestion problem. South America needs and desires to build modern highways. So, delegates from the "good neighbor" nations will attend the Road Show-Convention, in numbers never before recorded, to preview the latest American road-building equipment and to gather up-to-date data on the science of American highway construction.

North Atlantic Highway Officials Meet

The Association of Highway Officials of North Atlantic States has selected Atlantic City as the meeting place for their Sixteenth Annual Convention which will be held on February 14, 15 and 16, 1940. Convention headquarters will be at the Hotel Ambassador where the same arrangements as last year will be in effect regarding meeting room and space for exhibits.

Association president Logan has appointed the following as a Program Committee for the coming convention: George H. Henderson, Rhode Island, Chairman; H. O. Schermerhorn, New York; and Thomas C. Frame, Pennsylvania. This committee is engaged in the preparation of a program of papers and discussions in keeping with the popular subjects of the times. There will also be reports by standing committees on the results obtained thus far.

A. Lee Grover, Secretary-Treasurer of the Association suggests that early application for hotel reservations be made at the Hotel Ambassador to avoid later disappointment.

Government: World's Largest Construction Agency

The Bureau of Reclamation closed its fiscal year as the world's largest construction agency, in control of the world's greatest volume of stored water and administering unequaled sources for generating electrical energy but still unable to meet the demand for its services according to a recent report issued by the Bureau.

Steady and swift progress has been made on the Bureau's construction program, spread over 30 projects in 12 states. Reclamation engineers finished eight dams and had eleven more under construction, with 24 authorized but not yet started. Two of the completed dams are outstanding: Bartlett, the highest multiple-arch dam in the world, on the Verde River in Arizona, and Parker, called alternately the "deepest" and the most beautiful dam in the world, on the Colorado River, 150 miles below Boulder. Meanwhile, work on mammoth Grand Coulee Dam is well ahead of schedule, and the excavation work for Shasta Dam, main feature of the Great Central Valley Project in California, is in full swing (see Excavating Engineer for October, 1939).

The Bureau also built during the fiscal year more than 250 miles of canals, 138 miles of drains, 32 tunnels of a total length of more than five miles, 750 miles of road, nearly 13 miles of railroad, more than 350 miles of transmission line, 70 miles of pipe line, 11,000 canal structures, 290 bridges, and almost 1,000 culverts and 100 flumes.

Pacific Constructors Install Largest Conveyor Belt

Another world's construction record will be broken with the completion of Shasta Dam's 9.6 mile conveyor belt which will be used to carry aggregates from Redding, California to the dam site. (For complete article on Shasta Dam see Excavating Engineer for December, 1939.)

Roughly following the general contour of the rolling desert intervening between Redding and Shasta Dam, the belt-conveyor will begin its haul at an elevation of 490 feet, carry through a pass at a maximum altitude of 1450 feet and make delivery to its extreme northern terminal at an elevation of 650 feet.

First shipment of belt, which is being built by the Goodyear Tire & Rubber Company of Akron, Ohio, was made December 15 when 9,000 feet were delivered. Installation is scheduled to be completed by March 1, 1940 and the system placed in operation by April 1, 1940.

The conveyor system will be erected on wooden bents varying in heights above the ground from four to 90 feet and will require the use of 12,500 steel troughing idlers furnished by the Chain Belt Company of Milwaukee, Wisconsin. The 26 terminals at which links of the system overlap, will be combination steel and wood construction. Dumping from one unit to another at the 25 transfer points will employ the use of steel chutes.

In operation on its 9.6-mile route the conveyor system will carry the aggregates for the Shasta dam over the Sacramento river at two points; over one main state highway and five county roads; across four creeks and the main line of the Southern Pacific Railroad.

The 26 links of the system each will be motivated with 200 horsepower electric motors, excepting the three most northern units which will generate power because they are down-grade, or lowering conveyors. The component weight of the material on the slope makes these belts self operating.

Course of the conveyor will be through the middle of an 80-foot right-of-way cleared through manzanita brush its entire length and will deviate from a straight line haul at several points to avoid hill tops on a direct line between the gravel plant at Redding and the delivery site at Coram, scene of the Shasta Dam construction operations.

Capacity of the system will be 1100 tons per hour while conveying at a speed of 550 feet per minute. Material in transit will be on the conveyor one hour and 40 minutes between extremities. Four years of operation will be required to meet the total requirements of the dam construction project, estimated at 10,000,000 tons.

Greatest single-day requirement of aggregate at the dam site will be 22,000

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Wire Rope

Selected by the men who build your excavating and drilling machinery, Bucyrus-Erie rope has the special features that spell better performance. B-E wire rope has a uniform high quality, and comes in the right sizes, types, and construction for your exact needs. Send for wire rope bulletin.

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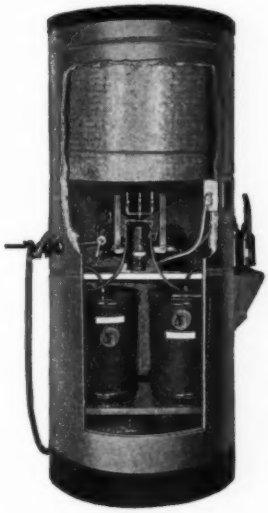
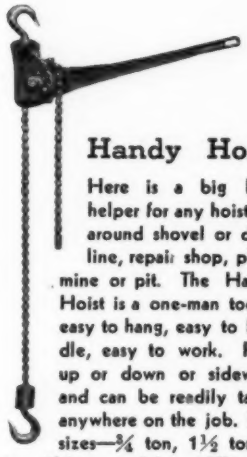
With the NEW Bucyrus Oil Reclaimer, used oil is reclaimed by a simple washing and filtering process at an average cost of about nine cents per gallon. It is a scientific fact, arrived at by leading research engineers and chemists throughout the country, that engine-use breaks down only the weaker and unstable molecules of your oil. These constitute about 10 per cent of the oil—the other 90 per cent, the strongest particles of the original oil can be separated and cleaned for re-use by the NEW Bucyrus Oil Reclaimer.

Investigate the possibilities of the Bucyrus Oil Reclaimer before you discard another quart of used oil.





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T-87

BUCYRUS-ERIE

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tons and the conveyor working at capacity can deliver 26,400 tons in a 24-hour period. The system will operate on a 24 hour daily basis and build up reserve supplies of aggregate at the dam, rather than attempt to match daily requirements.

When completed the system will be illuminated its entire length with sodium vapor lights, providing a spectacular sight to air travellers or others situated at high altitudes over a wide area. Purpose of the lighting, however, is to make continuous operation through the night feasible. There will be telephone stations at numerous points along the system and a motorized patrol will constantly be on duty. The system will have interlocking self-control arrangements which will stop the entire conveyor if anything should interfere with operation of any one unit and the approximate location of the stoppage will be indicated on the control panel.

During the rainy season a temporary cover will be built over the entire system to protect sand from getting wet in transit. The system will handle one class of aggregate at a time to simplify classification at the storage point near the dam.

Cleveland's 200,000,000 Gallon Reservoir

Under the direction of Frank Lewis, job superintendent, the Nottingham Filtration plant in Euclid Village, Ohio, is beginning to take form with the screen well almost dug out. When completed the plant will have the largest water capacity of any covered project of its kind in the world, 200,000,000 gallons being its capacity. The reservoir will supply the entire eastern half of Cleveland.

● Frank Lewis, the "boss man" of Cleveland's 200,000,000 gallon reservoir excavation operations. Behind him is the open screen well.

The screen well is 101 feet in diameter and will be about 100 feet deep. About 32,000 cu. yds. of earth and shale will have been removed from this well by the draglines and trucks that encircle the well and carry the dirt away. A long flight of stairs is fastened to the shale wall in the screen well to permit workers to reach the top. To break up the shale, heavy drilling was necessary for the dragline to operate.

Thus far the excavation figures show 35,000 cu. yds. for the filtered water conduit, 4,000 cu. yds. for the main drain, 224,200 cu. yds. for the reservoir, 64,000 cu. yds. for the filter, 157,400 cu. yds. for the coagulation basin, 32,000 cu. yds. for the screen well and 18,000 cu. yds. for the pumpwell. A tunnel, running 9 miles to Lake Erie will soon be begun.

NPBA Plans Meeting

The Thirty-Fourth Annual Meeting of the National Paving Brick Association will be held in Chicago, Illinois, January 30 and 31, 1940, at the Congress Hotel. In addition to the business meetings on the first day, the sessions on January 31 will be open to the general public. As the meeting is scheduled during the week of the 1940 Road Show-Convention of the American Road Builders' Association, the many "road builders" who will be in the city are cordially invited to attend the open session.

The program, now in preparation, will include papers and discussions by prominent engineers and contractors experienced in the use of brick for pav-

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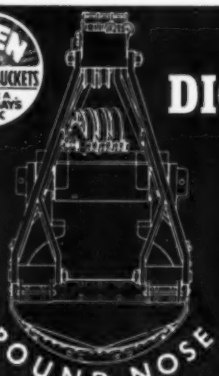

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ing purposes. Important recent developments in manufacturing, in the technique of testing and in construction practices will be presented. Experience with additional mileage of the Vibrated Monolithic Brick pavement—an outstanding development in paving design—including laboratory investigations of its structural strength will be covered. The Research Bureau of the Association, located at the Ohio State University Experiment Station, will make its annual report, containing a summary of the principal research projects. These include several co-operative studies with the U. S. Public Roads Administration and state highway departments.

The unique salvage value and durability of brick in the modernization and reconstruction of pavements will be described by engineers in actual charge of such programs. The adaptability of brick as a heavy duty type to highways that are important in national defense will be a particular theme of this convention.

C. C. Blair, head of the Metropolitan Paving Brick Company of Canton, Ohio, is President of the organization.

Louisiana Engineers To Meet

January 12-13 are the dates set by the Louisiana Engineering Society for their annual meeting at the St. Charles hotel in New Orleans.

The two-day convention will consist of a series of addresses inaugurated by the keynote speech of the Dean of the College of Arts and Sciences at Tulane University.

A visit to several industrial plants and an inspection tour by boat of the harbor facilities of the Port of New Orleans will round out the activities of the convention.

Census Bureau Digs For Facts

One of the biggest digging jobs in history is being conducted by the United States Census Bureau in 1940. It is digging for something as valuable as gold and as hard to obtain—facts. Among the facts it is looking for are many which, when assembled into statistical totals, will be of considerable significance to the excavating trade.

In part, the source material for these totals will be obtained from the trade itself, which will be required to fill out the construction schedule of the Census of Business, started in January for the first time in four years. On this schedule is a question concerning "kind of business" which will permit separation of the data for excavating and foundation subcontractors.

In addition, the Decennial Census of Mines and Quarries, also begun in January, will produce useful data for excavating engineers and executives. The Census of Housing, which is being taken for the first time, in April, will further assist the trade, and interest will attach to the Irrigation and Drainage aspects of the 1940 Census of Agriculture.

What facts will be called for from excavating and foundation contractors themselves? Dollar value of contracts received, from owners, and from other contractors. These must be classified according to type of construction involved, and location inside or outside of city limits. The classifications for type of construction used in this item are one and two family houses, other residential buildings, industrial buildings, office, institutional and other buildings, and repairs and alterations.

Then, dollar value of work actually performed, subdivided somewhat differently. Type of construction headings will be one and two family houses, other residential building, building other than residential, heavy construction and highway. Heavy construction operations here included which might involve excavating are harbors, dredging, levees, dams, reservoirs, irrigation and drainage projects, tunnels, sewers and water mains, etc.

Excavating companies will be required to show total employment and pay roll, with a breakdown of number employed by month, and of employment and pay roll by type of employee during a typical week. This will make evident the employment status during 1939 of excavating engineers and superintendents, and of salesmen for excavating firms.

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excavating trade, the Census of Mines and Quarries will present an up-to-the-minute picture of the distribution and extent of mining and quarrying operations. In addition to standard queries asked in 1930 on production by amount and value, etc., there will be new questions of importance to excavating men.

One concerns amount paid for work done during 1939 by contracting corporations, and the nature of such work. Answers here will reveal the revenue possibilities of such operations for excavating contractors.

Another deals with mechanical power loading machines in use, with listings for surface operation of power shovels, dragline excavators, scraper loaders, clamshells or orange peels, and other types; for underground work, shovel loaders, divided according to minimum working height, scraper loaders, including slushers, and other types.

The Irrigation and Drainage studies, begun in January, will reveal points of concentration for such projects, where sales effort can profitably be concentrated. The Drainage Census schedules will carry questions on additional length authorized for open ditches, levees and dikes, and tile drains; on cost of operation and maintenance of drainage works in 1939, and whether a contract was let for such work.

Census of Business enumerators will personally deliver schedules to all excavating firms, and will call for them after they have been filled out. Reporting is required by law, but the same statute protects those giving the answers against disclosure of individual returns, or their use for taxation, regulation or investigation.

The River Rats Dig In

By Floyd Suter Bixby

It is 9:15 a.m. on a bitter November morning; time for the radio operator aboard the "Captain William Clark" to receive the first broadcast of daily orders from the Kansas City office of the U. S. Engineers. In the radio room amidship of the luxurious sidewheeler, a message the crew has been expecting for two weeks crackles in over the receiver.

"Dig in for the winter at Gasconade," is the order relayed to Captain Clarence H. Friemonth, portly, iron-jawed, veteran master of river craft since God and Government records alone know when.

To Captain Friemonth, that radio message is a familiar story. It means that the "Clark" will get under way immediately for Gasconade, Missouri, to prepare the winter harbor there for the rest of the incoming fleet of river craft including dredges similar to the "Clark," towboats, quarterboats, launches, pile-drivers and barges. A large part of the Government fleet has wintered regularly in Gasconade for years, and the

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● End of the "Clark's" pipeline, showing discharge and winch house. Note baffle plate arrangement for moving of pontoon-mounted pipeline.

business of digging in for it is messy.

Gasconade Boatyard is situated at the confluence of the Missouri and Gasconade Rivers, about 100 miles upstream from the mouth of the Missouri. Almost every year high water on the Gasconade fills up the delta of the mouth with refuse of all kinds, including mud, sand, logs, treetops and railroad ties. This must all be removed when nests are dug for various river boats coming in to take refuge from floating ice in the Missouri.

For this season's digging in, about 800 feet of 30-inch pontoon-mounted pipeline was strewn behind the "Clark," and material was picked up through the dustpan-type snout of the dredge. Her steam driven pumps forced about 1600 cubic yards of solids per pumping hour through the pipeline. A baffle plate controlled by a winch at the end of the pipeline ran the line of discharge over a wide area of Missouri River, and "Ol Man Muddy" did the rest. He picked up the mud and deposited it where he saw fit. Logs and other debris were picked up from the dustpan ladder when it was raised above the water.

The "Clark" is a part of the fleet of dredges owned and operated by the U. S. Engineers of the Kansas City District. It is steam driven, oil burning, and is self propelled by huge sidewheels. Others of this type include the "Lewis," "Black," "Mitchell," and "Robert McGregor." One dipper dredge, the "Keokuk," completes the fleet.

When the fleet assigned to Gasconade is comfortably berthed, and the spuds are sunk in the river harbor deepened by the "Clark," winter repairs will be made to hulls, machinery will be overhauled if necessary, and thousands of feet of pipeline will be repainted and worked over. When this is done the fleet will be ready in the spring for another year.

OBITUARIES

(*Continued from page 24*)

George F. Schlesinger

George F. Schlesinger, chief engineer and secretary of the National Paving Brick Association, Washington, D. C., died after a heart attack at his home on December 1, 1939. Mr. Schlesinger was well known in engineering and road building circles throughout the nation. Since September, 1938, he had served as treasurer of the American Road Builders' Association.

Mr. Schlesinger was born in Xenia, Ohio, December 23, 1884. He was graduated from the Ohio State university as a civil engineer in 1907. After practicing civil engineering for six years, he joined the faculty of the Ohio State university engineering department. During the war he acted as engineer on government war construction projects at the Columbus Reserve Depot. In 1919, he became division engineer to the chief engineer of the Ohio State Highway Department and was appointed director of the state department of highways and public works in 1925. He resigned this office in 1928 to accept the post with the National Paving Brick Association, which he held until his death. He also edited the association magazine, "Dependable Highways."

Mr. Schlesinger was a past president of numerous engineering associations, including the Central Ohio Section of the American Society of Engineers, the Ohio Society of Professional Engineers, the Columbus Engineers Club and the Mississippi Valley Association of State Highway Departments.

He is survived by his wife, his daughter, Mrs. Henri John; a grandchild, Frances Rita John; a brother, Dr. Arthur M. Schlesinger, head of the Harvard university history department, and a sister, Mrs. Samuel Heitz of Dayton, Ohio.

Frank Ludlam

Frank Ludlam, Assistant Secretary and Assistant Treasurer of The International Nickel Company, Inc., died on December 8 at his home at 1130 Park Avenue, New York City, after a long illness.

Mr. Ludlam was born at Bloomfield, New Jersey, on November 3, 1873. He attended the Lyons School in New York City and the Columbia School of Mines, where he studied architecture. After spending several years in architecture and real estate, Mr. Ludlam took a position with The Carnegie Steel Company at Pittsburgh. In March, 1903, he came to The International Nickel Company.

He was a member of the Columbia University Club and the Kane Lodge F. and A. M.

Surviving are two sons, George P. and Kennedy R. of New York City. Mr. Ludlam's wife, the former Amy Roberts died in 1938.

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BROOKS EQUIPMENT AND MFG. CO., Knoxville, Tennessee

For your convenience in writing to Brooks Equipment and Manufacturing Company, you will find a card bound this issue.

Modernizing New England's Highways

(Continued from page 26)

"jack-of-all-work." When the job was visited to gather material for this article, the 20-B was rigged as a drag shovel, and under the supervision of Daniel Barillaro, pipe layer foreman, was busily scraping out trenches for reinforced concrete culvert pipes. Louis Greene, at the controls, then used the boom and dipper stick as a sort of crane with a folding boom. A chain, slung around the dipper, with a hook at the dangling end, sufficed to pick up the concrete pipes by their wire rope slings, take them from where they were piled beside the road and deposit them gently in the bottom of the trench in exact position. Then, like a fastidious cat, the little shovel reached out its clawed paw and carefully covered up the job it had done.

Other equipment on the second project included a Rex pump, which kept surplus water out of the bridge footings, and a Ransome Dual-Drum mixer, which made the concrete for the bridges and the box culvert and was later used on the concrete paving.

Employees on the two projects varied from 60 to 100 on the first and from 80 to 120 on the second. All labor conditions and wage rates were under Federal and State control, although the contractor paid his men considerably more than the legally required minimum rates.

As usual, there was no bonus offered to the contractor for finishing his work prior to the contract completion date, but there was, of course, a $25-per-day penalty clause. Fortunately, the weather was good throughout the progress of both jobs, so fast, continuous operation was possible.

The Men Behind the Job

W. J. Cox is Highway Commissioner for the State of Connecticut, with headquarters in Hartford. The first project was constructed under the supervision of D. C. Loewe, Engineer of Construction; Fred H. Johnson, Senior Highway Engineer and Inspector Floyd W. Phillips, Junior Highway Engineer, all of the Connecticut State Highway Department. The second project was also constructed under the supervision of Messrs. Loewe and Johnson, but the Inspectors for the State Highway Department were Edwin R. Moore, Jr., Highway Engineer, and William Tanner, Senior Engineering Aid.

A. I. Savin is chief executive of A. I. Savin Construction Company, which is responsible for the building of a number of important New England and other eastern highway and bridge jobs, including the Wilbur Cross Highway, Union, Connecticut; the recent Chenango Forks, New York (near Binghamton) highway relocation; the Housatonic River Bridge at Stratford, Connecticut, connecting the Wilbur Cross Highway with the Merritt Parkway; and the highway bridge and approach across the Moosup River at Moosup, Connecticut.

Temple Rutherford was Superintendent and Engineer for A. I. Savin Construction Company and Samuel Beere was Timekeeper on both projects.

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Small Sauerman Scraper offers an easy means of making a side-hill cut and fill for road.

SAUERMAN LONG RANGE MACHINES

Reservoirs

(Continued from page 23)

the job is in the rock at the gatehouse site and the location for the connecting aqueduct pipe. Since the required depth of holes varies considerably, both wagon drills and jackhammers are being used. Average depth of hole is about 20 feet, and holes are spaced about 4½ feet apart. Holes are loaded with 25 to 50 pounds of 60% Atlas explosive. From 20 to 40 holes are fired at a time.

The five earth dams included in the contract will contain a total of 125,000 yards. Part of this fill will come from the reservoir excavation, and part from borrow areas. Average height of these dams will be between 15 and 20 feet.

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BUCYRUS-ERIE

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Trade notes

The Bucyrus-Erie exhibit at the 1940 Road Show in Chicago will include many headline units of excavating and earth moving equipment as well as selected units from their specialty line. Among the excavating machines will be the new Bucyrus-Erie 54-B, 2½-yd. diesel powered shovel, the popular ⅜-yd. 10-B shovel, a 22-B crane equipped with a Rock Grab and a cut away 22-B revolving frame showing method of lubrication and mechanical details. The tractor equipment exhibit will feature several new models in bullgraders, bulldozers, 4-wheel scrapers and 2-wheel scrapers and the recently announced Bucyrus-Erie rippers and tamping rollers.

Broderick & Bascom Rope Company, St. Louis, Missouri, will exhibit, as their principal feature at the Chicago Road Show, a miniature wire rope strander and a miniature closing machine which will actually manufacture small diameter cord. These machines will be new to most of the contractors and should be of considerable interest to them.

George Haiss Mfg. Co., Inc., New York, New York, manufacturers of clam shell buckets have appointed the following new agencies: Tractor & Machinery Company, 351 Whitehall Street, S. W., Atlanta, Georgia; McClung-Logan Equipment Company, Key Highway & McComas Street, Baltimore, Maryland; M. B. Ogden, Graham Building, Jacksonville, Florida. Clam shell buckets are carried in stock with the Atlanta agent and also with the Baltimore agent.

The Mossman-Yarnelle Company, 230 Pearl Street, Fort Wayne, Indiana, have been appointed by the Harnischfeger Corporation as welder and electrode agents. They will operate on an open basis.

Appointment of Arthur C. Palm as General Manager of the Davey Compressor Company, Kent, Ohio, was announced recently by Paul H. Davey, President. Mr. Palm for the past three years has been Davey sales promotion and advertising manager. Prior to his present affiliation he was production manager of "Campaigns, Inc.," national advertising service.

W. H. Hammond, Sales Manager of the Hoist and Body Division of Gar Wood Industries, Inc., Detroit, has announced the recent appointment of the following hoist and body distributors: Robert P. Stapp, 209 S. 18th Street, Birmingham, Alabama; Lundberg Equipment Company, 257 N. Main Street, Logan, Utah; Cate Equipment Company, 722 S. State Street, Salt Lake City, Utah; Wilson Equipment & Supply Company, 902 West 22nd Street, Cheyenne, Wyoming.

The Ransome Concrete Machinery Company of Dunellen, New Jersey have just announced the appointment of Gopher Equipment and Supply Company, 1108 Second Ave. South, Minneapolis, Minnesota, to handle the complete Ransome line of concrete mixers, pavers, and truck mixers in all but a few counties in the states of Minnesota and Wisconsin.

Tag Equipment Company, 213 E. Tenth Street, Chattanooga, Tennessee, has just been assigned by the Ransome Concrete Machinery Company as representative to handle their entire line of Construction Equipment in that part of Tennessee east of the Tennessee River.

The Vern Wheeler Equipment Company announces the establishment of a new office and warehouse at 480 W. Spring Street, Columbus, Ohio. Among the nationally known equipment manufacturers being represented are: Northwest Engineering Co., Jaeger Machine Co., Macleod Co., Le Roi Co., Murphy Diesel Co., Independent Pneumatic Air Tool Co., Wire Rope Corp. of America, and other construction and machinery tool manufacturers.

Book reviews

The U. S. Department of Labor, Wage and Hour Division, Washington, announces that their pamphlet, "Employees' Digest of the Fair Labor Standards Act of 1938," can be had by interested persons from the nearest Wage-Hour office. This pamphlet describes the most important provisions of the Wage-Hour Law as it affects employers. Particular stress has been laid upon the calculation of overtime pay and the record-keeping requirements of the Act.

Three separate pamphlets, reprinted from the proceedings of the Twelfth National Asphalt Conference, are available, without charge, upon request to the Asphalt Institute, 801 Second Avenue, New York, New York. The pamphlets comprise twenty-three papers covering "Twenty Years of Progress." Especially interesting to the excavating field is the 72 page Construction series number 50 which deals with "Equipment for Earth Moving," "Rollers," "Graders," "Spreaders," "Maintenance Tools," etc.

The new bulletin on Bucyrus-Erie Placer Dredges, recently published by the manufacturer, is almost a reference manual on placer dredging. Not only does it describe mechanical and structural details of Bucyrus-Erie dredges, but it also contains instructions for computing sizes and outputs of placer dredges . . . an outline of data needed to determine size and design of dredges for specific jobs . . . and two full pages of formulae and computations useful in placer mining work. In addition, there's a 4-page insert that tells an interesting story of the beginnings of placer gold dredging in the United States. Consisting of 48 well-illustrated pages, plus the insert, this bulletin presents an unusual amount of varied information. For a free copy write to this magazine, or to Bucyrus-Erie Company, South Milwaukee, Wisconsin, and ask for Bulletin No. PD-4.

"Welding Hints" is a new service recently inaugurated by the Harnischfeger Corporation of Milwaukee. This service is designed toward effecting savings of money and time—and maintaining machines, making emergency repairs, and replacing or rebuilding worn parts. The "Welding Hints" consist of new and puzzling welding problems together with their solutions. They are printed on handy cards; and new additions to the series are made regularly. Each card handles a specific problem. Further information can be obtained by writing the Harnischfeger Corporation, Welding Division, Milwaukee, Wisconsin.

A bulletin on Regular Lay and Lang Lay Preformed Monarch Whyte Strand wire rope for all scrapers can be had from the Macwhyte Company of Kenosha, Wisconsin, or any of their distributors. Also available are copies of the new bulletin on Monel wire rope, used in slings and fittings, which contains tables of approximate tensile strength and weight per foot, in pounds.

The LeTourneau Method, a mining folder, graphically illustrates with job photographs that 'dozers, rooters, cranes and carryalls uncover new mining profits in coal, mineral and metal mines. Your copy of this 8 page folder can be had from LeTourneau, Inc., Peoria, Illinois, or any "Caterpillar" dealer.

Heil Quality News, a publication put out by the Heil Company, 3000 W. Montana Street, Milwaukee, Wisconsin can be received regularly by sending a post card to the company. The news carries photographs which illustrate the many kinds and applications of Heil equipment.

For those interested in a practical knowledge of reinforced concrete and its application in designing the principal members of modern structures, the Chemical Publishing Company, Inc., New York, New York, offers "Reinforced Concrete Construction" by M. T. Cantell. This book endeavors to simplify the work involving algebraical equations and mathematics and uses common symbols used in American practice. Chapters contain such titles as:

Reinforced Concrete, Design Loads, Beams Supporting Moving Loads, Designing Considerations, Floors and Columns. Copies sell for $3.00.

The Cleveland Trencher Company, 20100 St. Clair Avenue, Cleveland, Ohio, invites all who are interested to look over their line of machines illustrated in a new broadside. Photographs show the models 95, 110, 125 and 170 trench diggers, the pipe crane backfiller and the tamper-backfiller in action. Write for your copy.

The George Haiss Manufacturing Co., Inc., has brought out a new bulletin on all sizes of Haiss Hipower Clamshell Digging Buckets. Copies will gladly be sent to all writing to the manufacturer at New York, New York, or any of their representatives.

A four page catalog section on its line of Acidseal Paints, derived from rubber by a process which it developed and patented, has just been published by The B. F. Goodrich Company, Akron, Ohio, and is now available upon request. Acidseal paints, according to the manufacturer, dry by evaporation, during which the solid material is united to metal or any other clean, dry surface with practically an inseparable bond. They have many of the elastic properties of rubber, the hard, firm film conforming to the expansion, contraction or vibration of the painted surface without cracking.

The Four Wheel Drive Auto Company's 1940 issue of "Truck and Trailer Size and Weight Restrictions" has just been released and can be had by writing to the company at Clintonville, Wisconsin. This comprehensive knowledge of the road laws of every state is of vital necessity to you if your vehicles operate in more than one state.

A new folder, describing the new model "CH" Brooks Load Lugger, has just been released. Write to Brooks Equipment and Manufacturing Company, Knoxville, Tennessee, for Bulletin 209 should you be interested.

The new Wiley Engineering Handbook series has been announced by John Wiley & Sons, Inc., 440 Fourth Avenue, New York, New York. There are five volumes to the set which can be purchased separately or in combination. Each volume contains over one thousand pages of information and each volume pertains to a definite field. Write to the publishers for more information and prices.

The 1939 sixth edition of "Petroleum Facts and Figures," a 192-page book covering operations of the petroleum industry in all its branches, has been published by the American Petroleum Institute's Department of Public Relations. The new edition brings up to date all data in the 1937 fifth edition, and adds approximately 50 new or completely revised tables. As far as possible all usable new data available up to August 1, 1939, are included.

A new bulletin on the selection of General Electric arc-welding electrodes is now available. Prepared as a guide for the proper selection of electrodes, the publication also gives important suggestions on welding technique with different types of electrodes and presents some of the factors influencing their choice. Ask for GEA-1546F when writing to Schenectady, New York for your copy.

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